

## MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Overview

This technical guide covers 3 products: MacBook Pro (13-inch, Early 2011), MacBook Pro (13-inch, Late 2011), and MacBook Pro (13-inch, Mid 2012) computers.

For full technical specifications, refer to AppleCare Tech Specs: <http://support.apple.com/specs/>



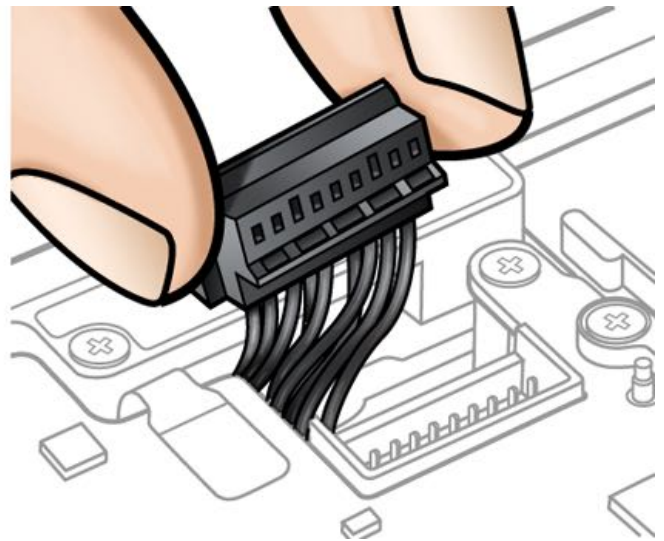
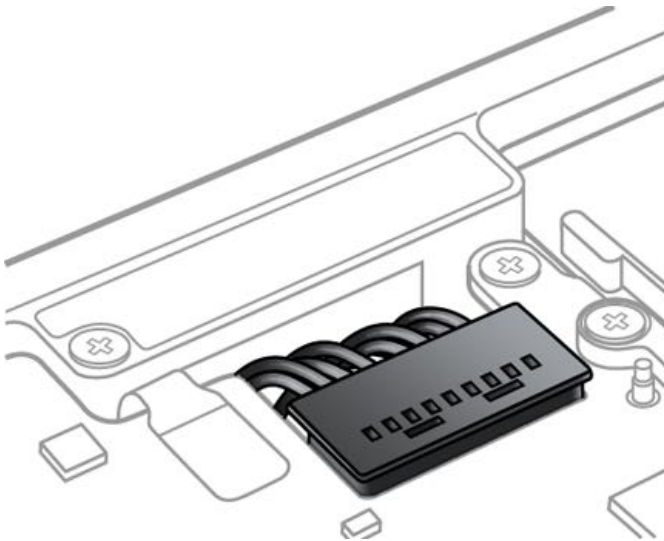
## MacBook (13-inch, Late 2009, Mid 2010) and MacBook Pro (13-inch, Mid 2009, Mid 2010, Early / Late 2011, Mid 2012): Safety - Battery Precautions

This computer contains an internal-only battery that is serviceable by Apple-authorized service providers only. Tamper-resistant screws are employed to prevent users from attempting to remove it.



**WARNING:** Every time you remove the bottom case, disconnect the battery cable from the logic board.

**WARNING:** Because the battery is internal and connected to the logic board by a cable, it **MUST BE DISCONNECTED** before performing service procedures. If you fail to do so, live current from the battery will short circuit the components and render the logic board and/or LVDS cable unusable.



## MacBook Pro (13-inch, Early/Late 2011, Mid 2012), MacBook Air (11-inch, 13-inch, Mid 2011, Mid 2012, Mid 2013): Thunderbolt

Thunderbolt is a revolutionary I/O technology that supports high-resolution displays and high-performance data devices through a single compact port. It sets new standards for speed, flexibility, and simplicity. Read more at <http://www.apple.com/thunderbolt>.

**Important:** Thunderbolt requires up-to-date software and firmware to function properly. Obtain the latest updates via Software Update.

**Caution:** The Thunderbolt port is keyed for cable insertion in only one direction. Be sure to insert cables with the correct orientation. Do not use excessive force if the cable does not fit.

## MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Keyboards

MacBook Pro (13-inch, Early 2011) computers manufactured after OS X Lion shipped feature a new keyboard. Differences between the original keyboard and OS X Lion keyboard include glyph changes on the F3 and F4 keys.

MacBook Pro (13-inch, Late 2011) and MacBook Pro (13-inch, Mid 2012) all ship with the Lion keyboard.

**Important:** When performing a replacement of the top case or logic board, you must pair the correct version of the keyboard and logic board with the system serial number. Failure to do so could cause unexpected keyboard behaviors.

### Original Keyboard for MacBook Pro (13-inch, Early 2011)



### OS X Lion Keyboard for MacBook Pro (13-inch, Early / Late 2011 and Mid 2012)





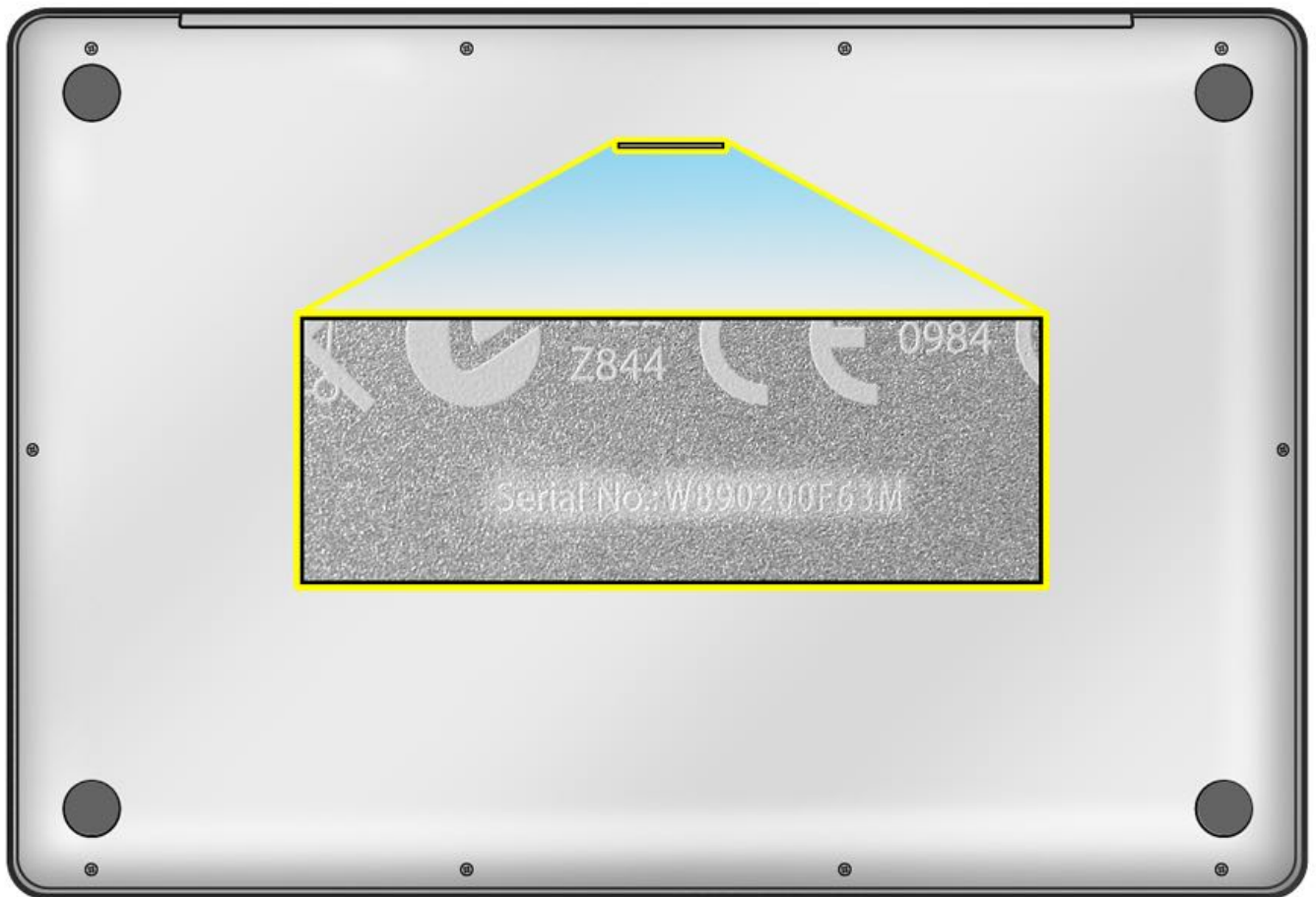
## Portables: Keycap Replacement

Service packages of replacement keycaps are available for designated portable computers. The packages allow you to replace individual keycaps rather than the entire top case.

Keycap packages vary based on computer model, key color, and type of keyboard. For links to step-by-step instructions and package part numbers for specific models, refer to Apple Support article [OP120: Apple Portables: Keycap replacement matrix](#).

## MacBook Pro (2009, 2010, 2011, 2012): Serial Number Location

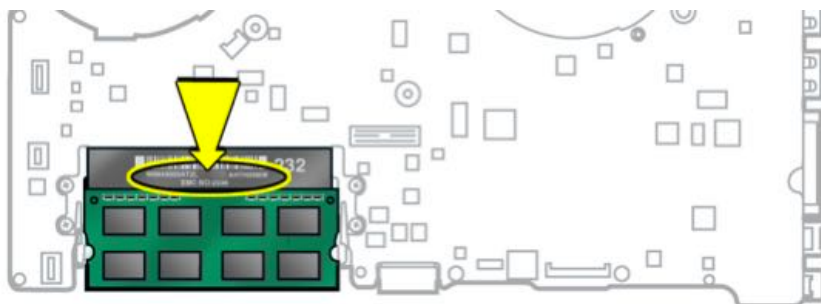
Turn over the computer to see the serial number etched on the bottom case near the hinge.



## MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Bar Code Serial Numbers on Memory Bracket

Additional bar code serial numbers are available inside the bottom case on the memory bracket. The serial numbers include two sets of alphanumeric characters:

Serial Number	Early and Late 2011	Mid 2012
System	12 characters	12 characters
Logic Board	17 characters	17 characters



Note: If your repair site has a bar code reader, you can use it to read the serial numbers on the memory bracket.

For more information, refer to Apple Support article [OP51: Frequently Asked Questions and Answers Concerning Apple's New Serial Number Format](#).

## MacBook Pro (13-inch, Mid 2012): 2D Bar Codes and Scanner Update

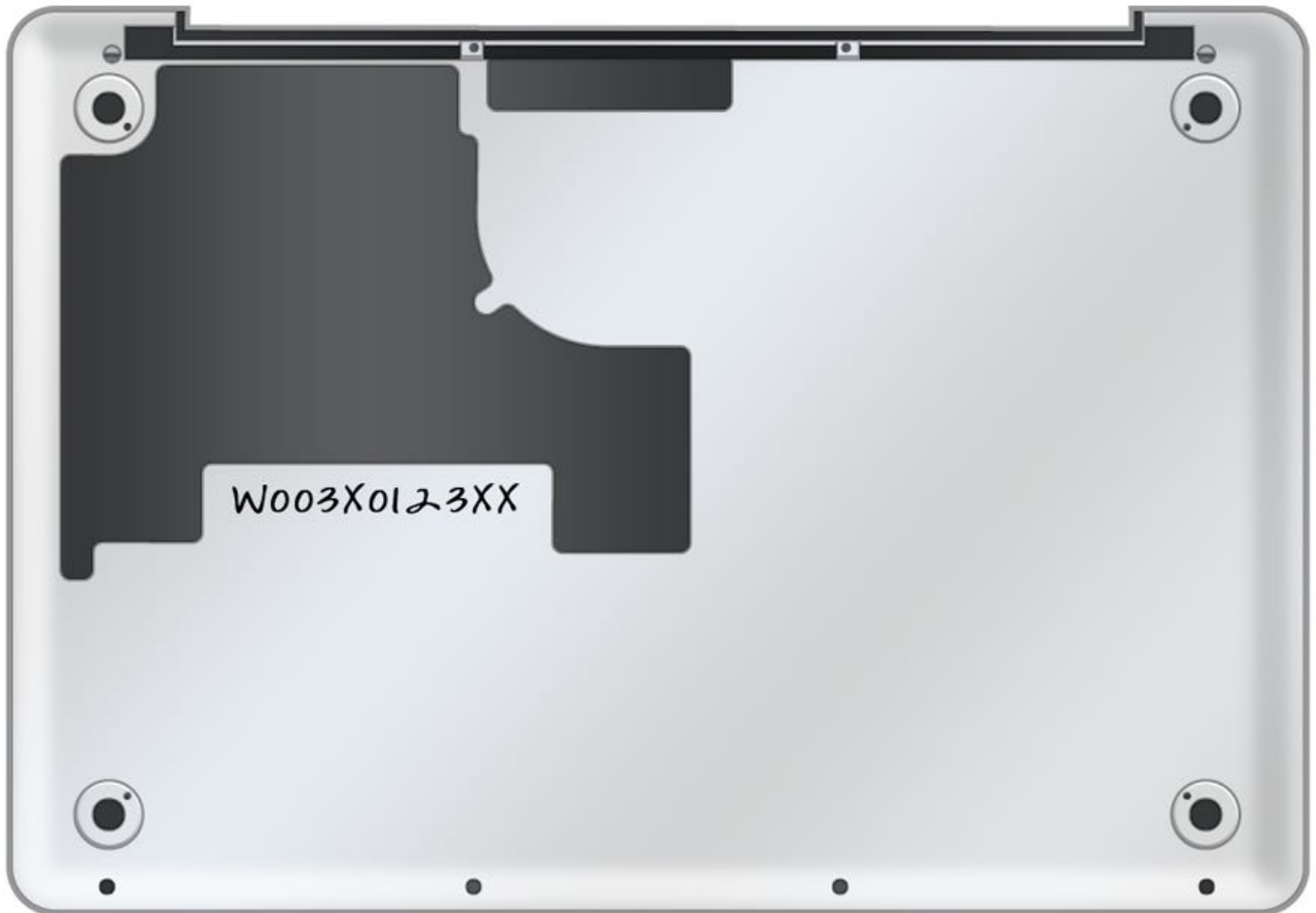
The MacBook Pro (13-inch, Mid 2012) incorporates 2D bar codes which require service providers to update their bar code scanners. It is important to upgrade your scanner configuration to read 2D barcodes in order to enter part serial numbers in GSX.

To upgrade the Motorola DS6707 scanner, go to Apple Support article [OP53: Motorola Symbol DS6707 Scanner Information and Configurations](#).

## MacBook Pro (13-inch, Mid 2009, Mid 2010, Early / Late 2011, Mid 2012): Transferring the Serial Number

When replacing a bottom case, retain the user's bottom case until the repair is complete. Before installing the replacement bottom case, use a fine tip permanent marker to write the original serial number clearly and legibly in uppercase box letters directly onto the inside of the new bottom case.

**CAUTION:** Take great care in deciphering the small typeface of the etched serial number on the bottom case. You might need a magnifying glass to see it clearly. It is imperative that you transfer the correct alphanumeric characters. Keep in mind that Apple serial numbers always use the numbers 1 and 0 instead of the Roman letters "I" and "O."



# General Troubleshooting

## Update Software and Firmware

**Important:** Before you begin troubleshooting, ensure the correct version of OS X is installed, and check for and apply the latest software and firmware updates. Computers sometimes exhibit symptoms that indicate the wrong version of OS X system software is installed. Check Apple Support article [HT1159: Mac OS X versions \(builds\) for computers](#) to make sure system build is correct for this computer model.

Firmware is the name given to software that is written into memory circuits such as flash memory, that will hold the software code indefinitely, even when power is removed from the hardware. Firmware on Intel Mac computers is designed to be updated if necessary by running the OS X Software Update check (available in the Apple () menu) while computer is connected to the Internet.

For more information about firmware updates, refer to Apple Support articles:

- [HT1557: About firmware updates for Intel-based Macs](#)
- [HT1237: EFI and SMC firmware updates for Intel-based Macs](#)

## Troubleshooting Theory

For more information about troubleshooting theory, go to [AppleCare Service Training](#) > Courses > Technician > Troubleshooting, and choose [Troubleshooting Theory](#) from the course list.

## Hardware vs. Software

To isolate a hardware issue from a software issue, refer to Apple Support article [TS1388: Isolating issues in Mac OS X](#).

To troubleshoot a software issue, refer to the following Apple Support articles:

Mac OS X v10.6 and later

- [HT3258: OS X: About the incompatible software folder](#)

Mac OS X v10.6 and earlier

- [TS1394: Troubleshooting Mac OS X installation and software updates \(Mac OS X v10.6 and earlier\)](#)
- [HT1199: Mac OS X: How to troubleshoot a software issue](#)
- [HT2186: Don't install a version of Mac OS X earlier than what came with your Mac](#)
- [HT2956: Troubleshooting Mac OS X installation from CD or DVD](#)

# Quick Check Procedures

## Resetting the System Management Controller (SMC)

The System Management Controller (SMC) is a chip on the logic board that controls all power functions. If the computer is experiencing any power issue, such as not starting up, not displaying video, sleep issues, or fan noise issues, resetting SMC may resolve it.

For more information and instructions to reset the SMC on different computer models, refer to Apple Support article [HT3964: Intel-based Macs: Resetting the System Management Controller \(SMC\)](#).

**Note for iMacs:** If you press the power button while inserting the power cord, the iMac will enter a mode in which the fans run at full speed. For more information, refer to Apple Support article [TS1433: iMac: Fans run at full speed after computer turns on](#).

## Resetting Parameter RAM (PRAM)

PRAM stores certain system and device settings in a location that OS X can access quickly. Exactly which settings are stored in the computer's PRAM varies depending on the type of computer as well as the types of devices and drives connected. To reset PRAM:

1. Shut down the computer.
2. Locate the following keys on the keyboard: Command, Option (Alt), P, and R. You will need to hold these keys down simultaneously in Step 4.
3. Press power button.
4. Immediately press and hold Command-Option-P-R keys.  
**Important:** You must press this key combination before the gray screen appears.
5. Hold down keys until computer restarts, and you hear startup chime a second time.
6. Release keys.

For more information, refer to the following Apple Support articles:

- [HT1242: Mac OS X: What's stored in PRAM](#)
- [HT1379: Resetting your Mac's PRAM and NVRAM](#)

## Starting Up in Safe Mode

Safe Mode is the state into which you can start up your Mac by performing a Safe Boot. Starting up into Safe Mode does several things that can help troubleshoot and resolve software or directory issues that may exist on the startup volume. To start up in Safe Mode:

1. Make sure computer is shut down.
2. Press power button.
3. Immediately after you hear startup sound, press and hold Shift key.  
**Note:** The Shift key should be held as soon as possible after startup sound but not before.
4. Release Shift key when you see the screen with a gray Apple and progress indicator (looks like a spinning gear). Note that booting into Safe Mode will take longer than a normal startup. During startup in OS X v10.4 through OS X v10.6.8, you will see "Safe Boot" on the login window, which appears even if you normally log in automatically. In OS X v10.6 and later, a gray progress bar is also displayed on the bottom of the window during Safe Boot. During startup in OS X v10.2 through v10.3.9, you will see "Safe Boot" on the OS X startup screen.
5. To leave Safe Mode, restart computer normally, without holding down any keys during startup.

For more information, refer to the following Apple Support articles:

- [HT1564: Mac OS X: What is Safe Boot, Safe Mode?](#)
- [HT1455: Mac OS X: Starting up in Safe Mode](#)
- [TS1884: Safe Boot takes longer than normal startup](#)

# MacBook Pro (13-inch, Early 2011, Late 2011, Mid 2012): Diagnostic Software

The following diagnostic software is required for troubleshooting MacBook Pro (13-inch, Early 2011, Late 2011, Mid 2012):

## MacBook Pro (13-inch, Early 2011)

- **Apple Service Diagnostic (ASD)**: version [3S144](#)
- **Apple Hardware Test (AHT)**: version [3A208](#)

## MacBook Pro (13-inch, Late 2011)

- **Apple Service Diagnostic (ASD)**: version [3S148](#)
- **Apple Hardware Test (AHT)**: version [3A222](#)

## MacBook Pro (13-inch, Mid 2012)

- **Apple Service Diagnostic (ASD)**: version [3S155](#)
- **Apple Hardware Test (AHT)**: version [3A244](#)

## **Apple Service Toolkit (AST)**

AST is a suite of diagnostic tools that checks Intel-based Mac hardware components, and provides detailed diagnostic logs for review. AST runs on a local server, managing multiple Ethernet clients via NetBoot.

For more information, refer to Apple Support articles:

- [OP476: Latest Apple Service Toolkit download links and documentation](#)
- [TP586: AST Reference Guide](#)

## **Mac Resource Inspector (MRI)**

MRI, which is part of AST, is a quick triage tool that checks for the presence of hardware and reports sensor readings. Sensors are located on a variety of parts, including cables, fans, storage devices, power supply, display panel, and logic board. Use MRI to help isolate failures and avoid unnecessary part replacements. MRI complements ASD, which is a more in-depth repair verification tool.

**Note:** If all AST checks pass and a component is still suspected of fault, then verify with other diagnostic tools.

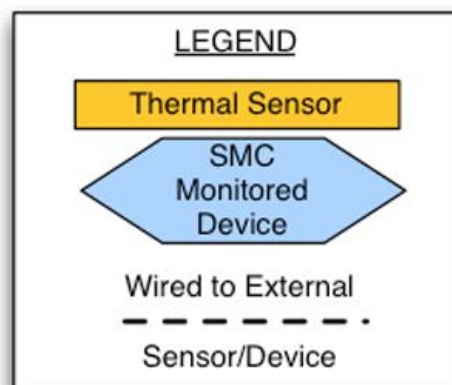
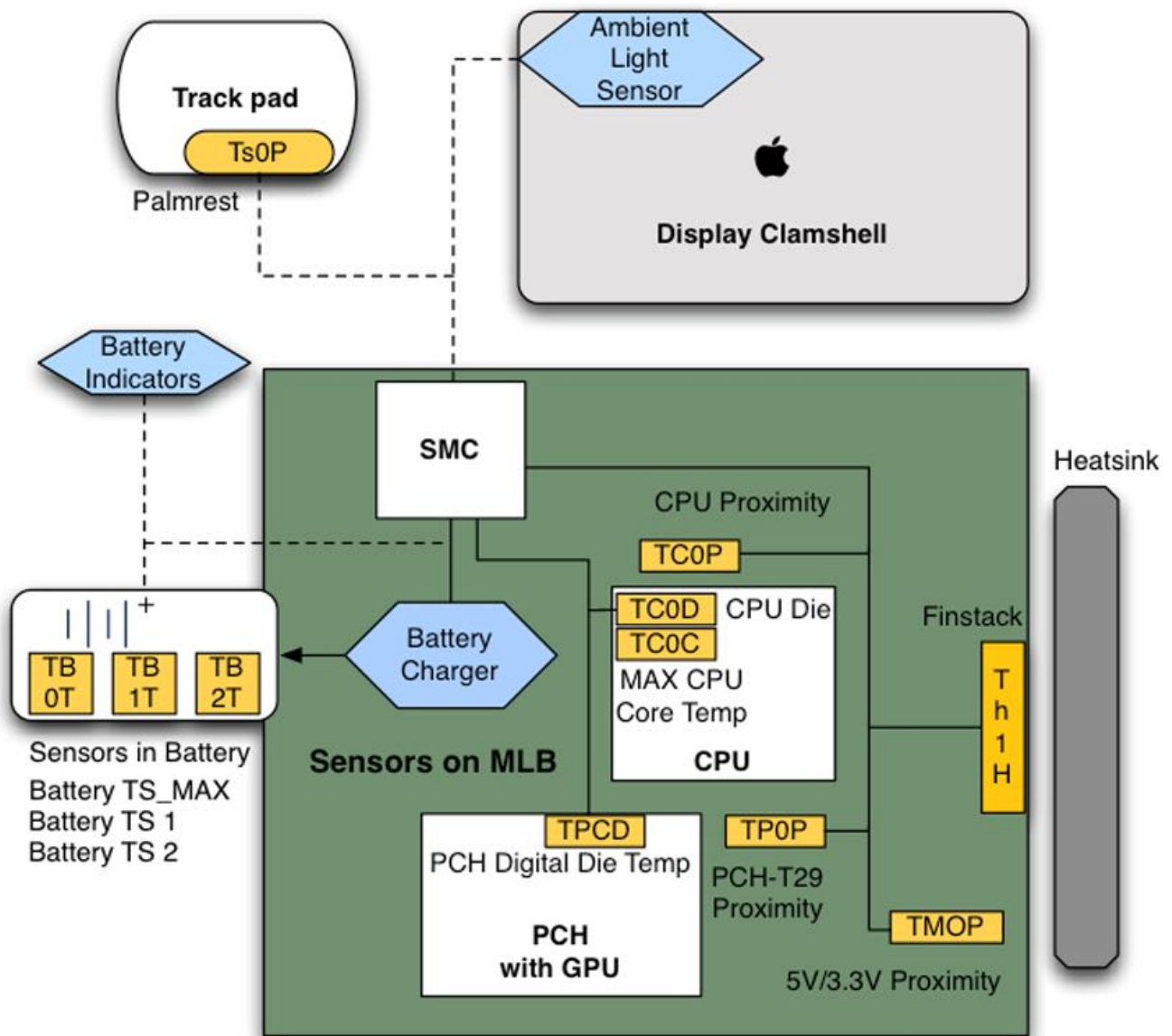
## **Thermal Sensor Map**

This map shows the general location of the thermal sensors (highlighted in gold) and their associated part within the computer housing.



Name	Location	Description	MRI/ASD Name
TC0D	Logic board	CPU Die	CPU Die
TC0P	Logic board	CPU Proximity	CPU Proximity
TP0P	Logic board	PCH-Proximity	PCH Proximity
TM0P	Logic board	5V & 3.3V Proximity	Battery Charger Proximity
TC0C	Logic board	Max CPU Core Temp	CPU Die - Digital Core
Th1H	Logic board	Fin Stack Proximity	Fin Stack Proximity
Ts0P	Trackpad	Palmrest	Palmrest
TB0T	Battery	Battery TS_MAX	Battery TS_MAX
TB1T	Battery	Battery TS 1	Battery TS 1
TB2T	Battery	Battery TS 2	Battery TS 2

Electrical Sensor	Location	General Description	MRI/ASD Name
ALSL	Display	Ambient Light Sensor	ALS
VDOR	Logic Board	DC IN (Voltage)	DC In
VPOR	Logic Board	PBus (Voltage)	PBus
VC0C	Logic Board	CPU Vcore (Voltage)	CPU
VN0R	Logic Board	AXG Vcore (Voltage)	AXG Vcore
ID0R	Logic Board	DC In (AMON) (Current)	DC In
IB0R	Logic Board	Battery (BMON) (Current)	Battery
IC0R	Logic Board	Computing (Combined cores)	CPU VcoreVTT
IO0R	Logic Board	5V & 3.3V Others	Other <5V & 3.3.V>



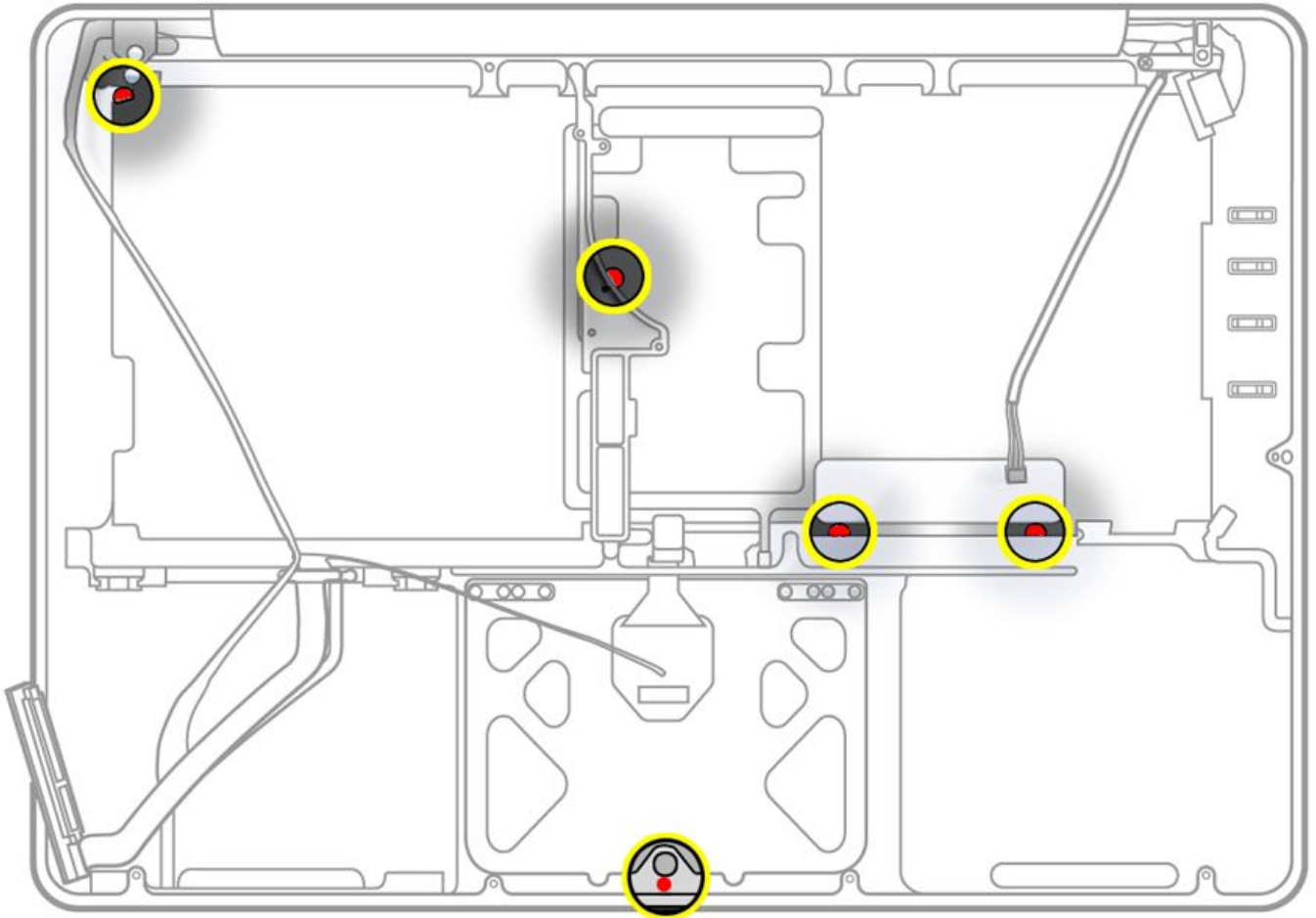
## Portables: Temperature Concerns

The normal operating temperature of this computer is well within national and international safety standards. Nevertheless, users may be concerned about generated heat. To prevent an unneeded repair, you can compare a user's computer to a similar running model, if available at your repair site. For more information, refer to Apple Support article [HT1778: Mac notebooks: Operating temperature](#).

## MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Liquid Contact Indicators

To help discover accidental damage to the computer, the top case includes spill sensors called liquid contact indicators (LCI). The sensors are only visible when the bottom case and most of the modules have been removed. Normally small, white dots, the LCIs turn red when they have come into contact with liquid, such as an accidental spill.

For more information, refer to Apple Support article [OP98: About liquid contact indicators \(LCI\) on portable and desktop computers](#).



# LCD Pixel Anomalies

When displaying a single color over the screen area, the LCD panel might show one or more pixels that are not properly lit.

LCD technology uses rows and columns of addressable points (pixels) that render text and images on the screen. Each pixel has three separate subpixels—red, green and blue—that allow an image to render in full color. Each subpixel has a corresponding transistor responsible for turning that subpixel on and off.

Depending on the display size, there can be thousands or millions of subpixels on the LCD panel. For example, the LCD panel used in the iMac (27-inch, Late 2012) has a display resolution of 2560 x 1440, which means there are 3.7 million pixels. Each pixel is made up of a red, a green, and a blue subpixel, resulting in over 11 million individual picture elements on the 27-inch display. Occasionally, a transistor may not work perfectly, which results in the affected subpixel remaining off (dark) or on (bright). With the millions of subpixels on a display, it is possible to have a low number of such transistors on an LCD. In some cases a small piece of dust or other foreign material may appear to be a pixel anomaly. Apple strives to use the highest quality LCD panels in its products, however pixel anomalies can occur in a small percentage of panels.

In many cases pixel anomalies are caused by a piece of foreign material that is trapped somewhere in the display or on the front surface of the glass panel. Foreign material is typically irregular in shape and is usually most noticeable when viewed against a white background. Foreign material that is on the front surface of the glass panel can be easily removed using a lint free cloth. Foreign material that is trapped within the screen must be removed by an Apple Authorized Service Provider or Apple Retail Store.

To determine if the display has an acceptable number of pixel anomalies, see the appropriate Apple Support article:

- [HT4044: About LCD display pixel anomalies for Apple products released in 2010 and later](#)
- [HT1721: About LCD display pixel anomalies for Apple products released before 2010](#)

## MacBook Pro: Display Hinge Behavior

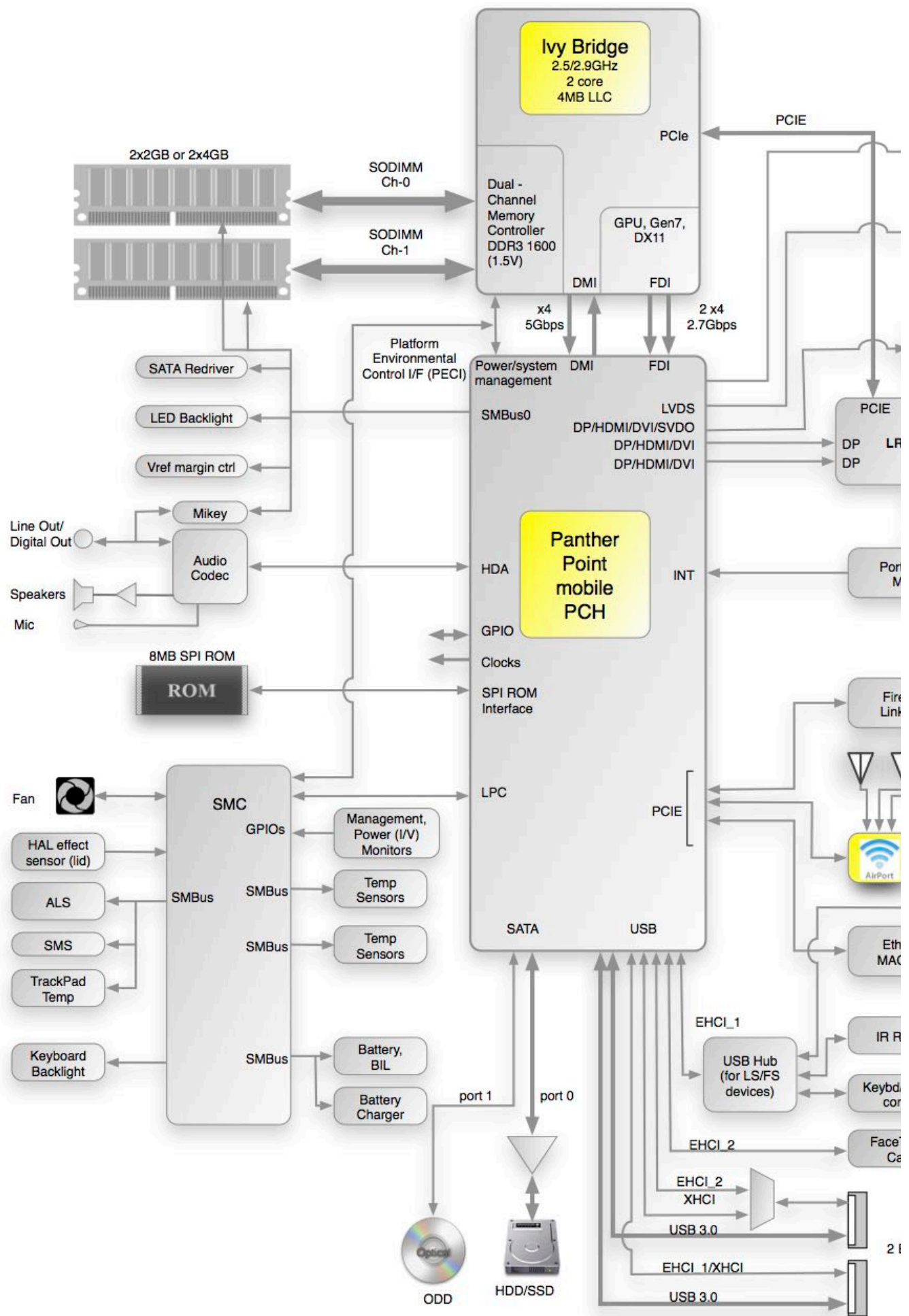
MacBook Pro models have a unique counterbalanced clutch system. The design provides a smooth, fluid feel when opening, closing, or positioning the display. The counterbalanced clutch system was designed so that when the display is vertical with respect to the ground, it will remain in place regardless of the angle of the base.

Moving display past vertical allows the hinges to release and the display to close. This is normal behavior and no repair is necessary. For more information, and to watch a video of normal hinge behavior, see Apple Support article [HT3304: MacBook Pro: Display hinge behavior](https://support.apple.com/HT3304).



## MacBook Pro (13-inch, Mid 2012): Block Diagram

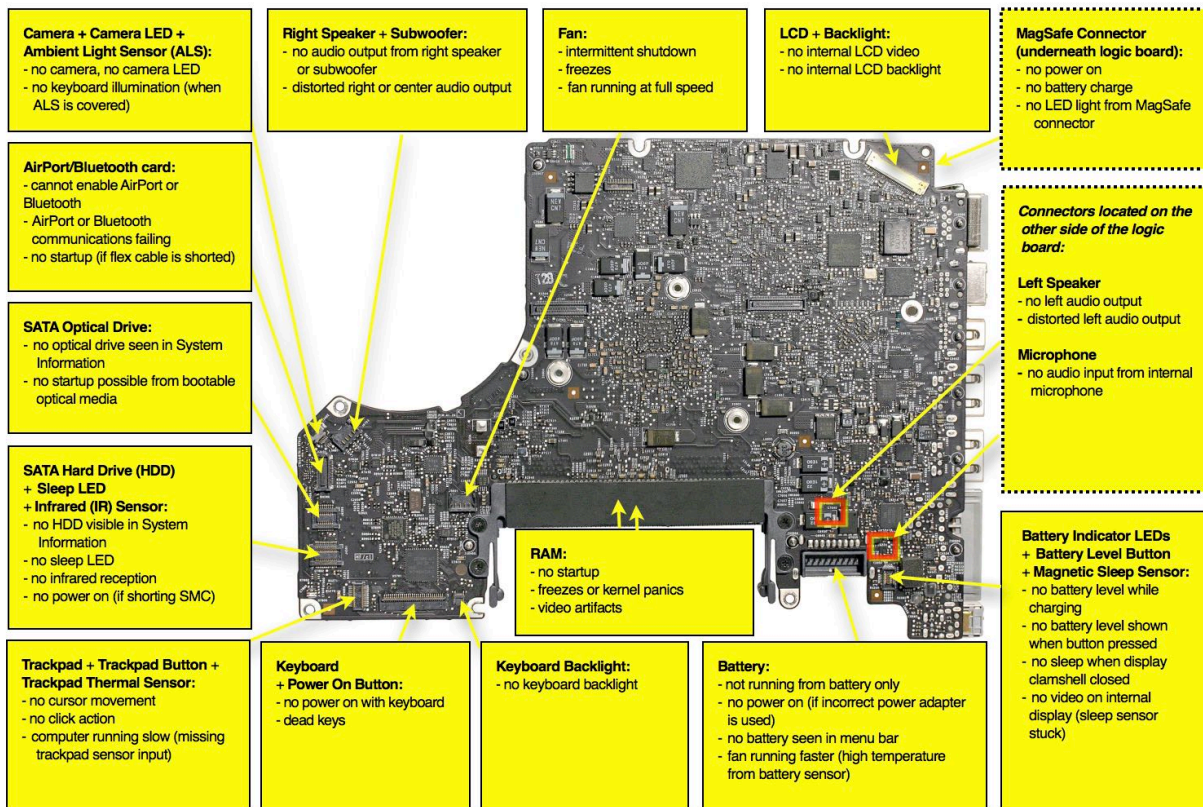
Refer to this diagram to see how modules are interrelated in MacBook Pro (13-inch, Mid 2012).





# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Functional Overview

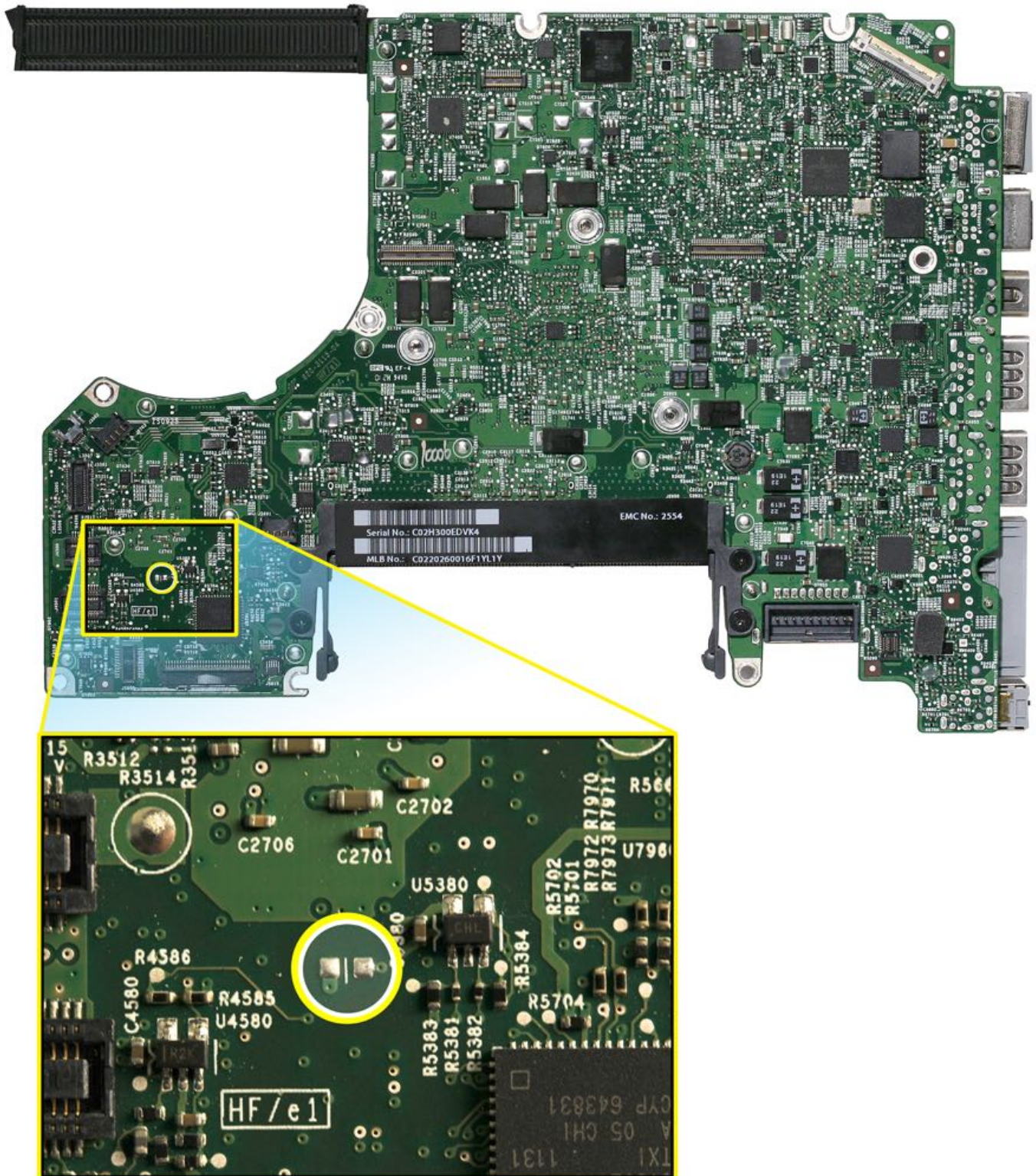
Refer to this diagram for symptoms related to logic board connectors in MacBook Pro (13-inch, Early 2011), MacBook Pro (13-inch, Late 2011), and MacBook Pro (13-inch, Mid 2012).



## MacBook Pro (13-inch, Mid 2012): Logic Board Power-On Pads

On the logic board of the MacBook Pro (13-inch, Mid 2012), there are two pads that can be shorted to power on the computer. These pads are located to the left of the memory slots and above a silk screened "HF/e1" on the logic board. The power-on pads are shiny, silver, square, and larger than the other (mostly round) silver pads nearby.

**Important:** Only short these two pads and no other pads, or you may damage the logic board. The tip of a Torx T8 or T10 screwdriver is about the right size to touch these two pads, without touching other nearby components.





# MacBook Pro (13-inch, 15-inch, Mid 2012): AirPort Card Not Recognized

## Unlikely causes:

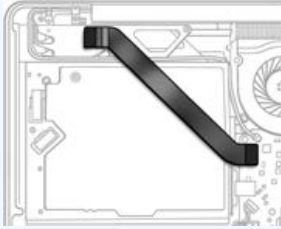

Battery, bottom case, fan, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, speakers, top case, trackpad

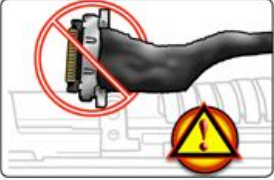
## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>AirPort cannot be enabled.</li><li>AirPort not detected or available in System Information (System Profiler in Snow Leopard).</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.</li><li>Start up from known-good original system media or an up-to-date, bootable OS X volume, and attempt to connect to a known-good wireless access point.</li><li>Check for and apply the latest software and firmware updates.</li></ol>



## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run Mac Resource Inspector (MRI) or check System Information to verify that AirPort card is recognized.	Yes	Go to “AirPort Connection Issues” troubleshooting flow.		
	<b>System Information (Lion):</b> <ul style="list-style-type: none"><li>Network &gt; Wi-Fi &gt; Interfaces</li></ul>	No	Go to step 2.		
	<b>System Profiler (Snow Leopard):</b> <ul style="list-style-type: none"><li>Network &gt; AirPort &gt; Interfaces</li></ul>				
	Is AirPort service detected in MRI or System Information?				

	Check	Result	Action	Code	Commodity
2.	<p>Depending on computer model, AirPort card might be either an AirPort/Bluetooth combo card on optical drive or a standalone AirPort card inside display clamshell hinge barrel. Use pictures to identify correct configuration for this computer.</p> <p><b>AirPort/Bluetooth combo card:</b></p>  <p><b>Standalone AirPort card:</b></p>  <p>Which configuration does this computer have?</p>	AirPort/Bluetooth Combo Card	Go to step 11.		
		Standalone AirPort Card	Go to step 3.		
3.	<p>Camera, AirPort, Bluetooth and ambient light sensor (ALS) components all share same cable connection to logic board. Reseat cable connection to logic board, then run MRI or check System Information for AirPort card.</p> <p>Is AirPort card detected in MRI or System Information?</p>	Yes	Go to step 4.		
		No	Go to step 6.		
4.	<p>Check whether MRI detected all other devices sharing same cable connection: camera, Bluetooth and ALS.</p> <p>Did MRI detect camera, Bluetooth and ALS modules?</p>	Yes	Go to step 5.		
		No	Replace display clamshell. Remember to transfer user's AirPort card. Verify issue resolved.	L16	LCD
5.	<p>Open and close display clamshell fully several times to make sure cables are not pinched or shorting out. Retest with MRI.</p> <p>Are AirPort, camera, Bluetooth and ALS modules still detected?</p>	Yes	Issue resolved by reseating camera cable. Verify issue resolved.		
		No	Replace display clamshell. Remember to transfer user's AirPort card. Verify issue resolved.	L16	LCD

	Check	Result	Action	Code	Commodity
6.	<p>Remove display clamshell from computer and take apart display clutch cover. Verify that AirPort cable connection is secure and correctly oriented. Also check that antenna connections are correctly routed and well-seated. Reassemble and run MRI or check System Information for AirPort card.</p> 	Yes	Go to step 4.		
		No	Go to step 7.		
7.	<p>Is AirPort card detected in MRI or System Information?</p> <p>To troubleshoot this issue completely, the following known-good parts are required.</p> <ul style="list-style-type: none"> <li>• AirPort card</li> <li>• Display clamshell</li> <li>• Logic board</li> </ul> <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 8.		
		No	Replace AirPort card. Verify issue resolved.	N18	WIRELESS DEVICE
8.	<p>Substitute a known-good AirPort card. Make sure AirPort flex cable is correctly oriented in its connection to AirPort card. Run MRI or check System Information for AirPort card.</p> <p>Is AirPort card detected in MRI or System Information?</p>	Yes	Replace AirPort card. Verify issue resolved.	N18	WIRELESS DEVICE
		No	Go to step 9.		
9.	<p>Continue using known-good AirPort card, and substitute a known-good logic board. Run MRI or check System Information for AirPort card.</p> <p>Is AirPort card detected in MRI or System Information?</p>	Yes	Replace logic board. Reinstall user's AirPort card. Verify issue resolved.	M35	MLB
		No	Go to step 10.		

	Check	Result	Action	Code	Commodity
10.	Continue using known-good AirPort card and logic board, and substitute a known-good display clamshell. Run MRI or check System Information for AirPort card.  Is AirPort card detected in MRI or System Information?	Yes	Replace display clamshell. Reinstall user's AirPort card and logic board. Verify issue resolved.	L16	LCD
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	N99	
11.	AirPort/Bluetooth card has a shared flex cable connection to logic board. Reseat connector to logic board. Run MRI or check System Information for AirPort/Bluetooth card.	Yes	Issue resolved by reseating AirPort/Bluetooth flex cable. Verify issue resolved.		
	Are AirPort and Bluetooth services both detected in MRI or System Information?	No	Go to step 12.		
12.	Reseat flex cable connection to AirPort/Bluetooth card. Run MRI or check System Information for AirPort/Bluetooth card.	Yes	Issue resolved by reseating AirPort/Bluetooth flex cable. Verify issue resolved.		
	Are AirPort and Bluetooth services both detected in MRI or System Information?	No	Go to step 13.		
13.	To troubleshoot this issue completely, you need the following known-good parts:	Yes	Go to step 14.		
	<ul style="list-style-type: none"> <li>AirPort/Bluetooth card</li> <li>Flex cable</li> <li>Logic board</li> </ul> Do you have these parts immediately available?	No	Replace AirPort/Bluetooth card. Verify issue resolved.	N18	WIRELESS DEVICE
14.	Substitute a known-good AirPort/Bluetooth card flex cable. Run MRI or check System Information for AirPort/Bluetooth card.	Yes	Replace AirPort/Bluetooth flex cable. Verify issue resolved.	X03	INTERNAL CABLE
	Are AirPort and Bluetooth services both detected in MRI or System Information?	No	Go to step 15.		

	Check	Result	Action	Code	Commodity
15.	Continue using known-good flex cable and substitute a known-good AirPort/Bluetooth card. Make sure flex cable is correctly oriented in its connection to AirPort/Bluetooth card. Run MRI or check System Information for AirPort/Bluetooth card.	Yes	Replace AirPort/Bluetooth card. Reinstall user's AirPort/Bluetooth flex cable. Verify issue resolved.	N18	WIRELESS DEVICE
	Are AirPort and Bluetooth services both detected in MRI or System Information?	No	Go to step 16.		
16.	Continue using known-good AirPort/Bluetooth card and flex cable, and substitute a known-good logic board. Run MRI or check System Information for AirPort/Bluetooth card.  Are AirPort and Bluetooth both detected in MRI or System Information?	Yes	Replace logic board. Reinstall user's AirPort/Bluetooth card and flex cable. Verify issue resolved.	M35	MLB
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	N99	
17.	<ul style="list-style-type: none"> <li>Connect to a known-good wireless network, and retest data throughput, checking for adequate transfer speeds.</li> <li>Verify that wireless connection is sustained for several minutes.</li> </ul> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	N99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): AirPort Connection Issues

## Unlikely causes:



Battery, bottom case, fan, hard drive, heat sink, logic board, MagSafe board, memory, optical drive, power adapter, speakers, top case, trackpad


## Quick Check

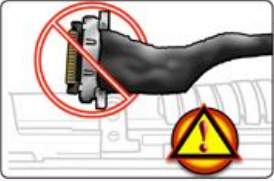
Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Unable to find or connect to wireless networks</li><li>• Slow or stalled data transfers</li><li>• Intermittent connection dropouts</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<p><b>On user's computer:</b></p> <ol style="list-style-type: none"><li>1. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>2. Check for and apply latest software and firmware updates.</li><li>3. Start up computer using known-good original system media or an up-to-date, bootable OS X volume, and attempt to connect to a wireless network.</li><li>4. In System Preferences &gt; Sharing &gt; Internet Sharing, configure a known-good computer to share an Ethernet connection to computers using AirPort. Try to connect user's computer to newly created wireless network.</li><li>5. Using known-good OS and base station, compare AirPort throughput to a similar system using Activity Monitor &gt; Network.</li><li>6. Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>7. Reset SMC using procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li></ol> <p><b>If issue cannot be reproduced onsite, prompt user to check user's AirPort base station for the following:</b></p> <ol style="list-style-type: none"><li>1. Check for base station firmware updates.</li><li>2. Check for nearby interference sources in 2.4/5GHz ranges, such as microwave ovens and cordless phones. See Apple Support article <a href="#">HT1365: AirPort and Bluetooth: Potential sources of wireless interference</a>.</li><li>3. Make sure base station is not using MAC address filtering or has not created a hidden network.</li><li>4. Make sure base station is not set to low-power transmission mode.</li><li>5. Make sure base station is not using an unsupported connection and encryption protocol.</li><li>6. Check for Wi-Fi channel overlap (a nearby base station using an adjacent channel).</li><li>7. Connect to a known-good test network.</li><li>8. Test in a different environment.</li></ol>


## Deep Dive



	Check	Result	Action	Code	Commodity
1.	<p>Run Mac Resource Inspector (MRI) or check System Information (System Profiler in Snow Leopard) to verify AirPort card is recognized.</p> <p><b>System Information (Lion):</b></p> <ul style="list-style-type: none"> <li>• Network &gt; Wi-Fi &gt; Interfaces</li> </ul> <p><b>System Profiler (Snow Leopard):</b></p> <ul style="list-style-type: none"> <li>• Network &gt; AirPort &gt; Interfaces</li> </ul> <p>Is AirPort service detected in MRI or System Information?</p>	Yes	Go to step 2.		
		No	Go to “AirPort Card Not Recognized” troubleshooting flow.		
2.	<p>Start up computer using known-good original system media or an up-to-date, bootable OS X volume. Attempt to reproduce AirPort performance or connection issue.</p> <p>Does issue persist with known-good OS?</p>	Yes	Go to step 3.		
		No	Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> , and install correct version of OS X. Check for and apply latest software and firmware updates. Verify issue resolved.		
3.	<p>Turn off Bluetooth to eliminate potential interference. Check for other interference such as microwave ovens or cordless phones. See Apple Support article <a href="#">HT1365: AirPort and Bluetooth: Potential sources of wireless interference</a>. Change AirPort base station channel.</p> <p>Does issue persist?</p>	Yes	Go to step 4.		
		No	Issue caused by interference. Remove sources of interference, or use a different AirPort channel or mode (2.4 or 5 GHz). Verify issue resolved.		
4.	<p>Remove bottom case. Depending on computer model, AirPort card may be embedded in display clamshell or be a combined AirPort/Bluetooth card located on the side of the optical drive. Using attached picture, identify correct configuration for this computer.</p>   <p>Which configuration does this computer have?</p>	Combo AirPort/Bluetooth card present	Go to step 5.		
		No Combo AirPort/Bluetooth card present	Go to step 10.		

	Check	Result	Action	Code	Commodity
5.	<p>Inspect AirPort antenna cable routing near display clutch for damage. Reseat antenna connections to AirPort/Bluetooth card. Make sure each connection is secure and correctly aligned and oriented.</p> <p><b>Caution:</b> If proceeding troubleshooting steps require reseating or replacing AirPort/Bluetooth card, note the AirPort/Bluetooth cable orientation reminder pictured here.</p>  <p>Are all antenna cables and connectors in good condition and securely seated?</p>	Yes	Go to step 6.		
		No	Replace display clamshell. Verify issue resolved.	L16	LCD
6.	<p>Verify that AirPort antenna connector ports on AirPort card are not damaged, loosened, or unsoldered.</p> <p>Are antenna connector ports in good condition?</p>	Yes	Go to step 7.		
		No	Replace AirPort/Bluetooth card. Verify issue resolved.	N14	WIRELESS DEVICE
7.	<p>Verify AirPort performance and reliability by starting up from known-good original system media or an up-to-date, bootable OS X volume. Connect to a known-good wireless network and download a large file from a website or file server. Compare performance to another known-good computer of similar type and AirPort specification. Verify throughput using Activity Monitor &gt; Network.</p> <p>Are performance and throughput comparable between user's computer and a known-good computer?</p>	Yes	AirPort performance is within specification. Verify issue resolved.		
		No	Go to step 8.		
8.	<p>To troubleshoot this issue completely, a known-good display clamshell is required.</p> <p>Do you have immediate access to a known-good display clamshell for this computer model?</p>	Yes	Go to step 9.		
		No	Replace AirPort/Bluetooth card. Verify issue resolved.	N14	WIRELESS DEVICE
9.	<p>Antennas are part of display clamshell assembly. Substitute known-good display clamshell, and retest, comparing performance and throughput of user's computer with known-good computer.</p> <p>Is performance and throughput comparable between computers?</p>	Yes	Replace display clamshell. Verify issue resolved.	L16	LCD
		No	Replace AirPort/Bluetooth card. Reinstall user's display clamshell. Verify issue resolved.	N14	WIRELESS DEVICE

	Check	Result	Action	Code	Commodity
10.	<p>Take apart display clamshell and display clutch barrel (where AirPort transmitter is housed) and inspect AirPort antenna cable routing for damage. Reseat antenna connections to AirPort card. Make sure each connection is secure and correctly aligned and oriented.</p> <p><b>Caution:</b> If proceeding troubleshooting steps require reseating or replacing AirPort card, note the AirPort cable orientation reminder pictured here.</p>  <p>Are all antenna cables and connectors in good condition and securely seated?</p>	Yes	Go to step 11.		
		No	Replace AirPort antenna. Verify issue resolved.	X03	OTHER ELECTRIC
11.	<p>Verify AirPort antenna connector ports on AirPort card are not damaged, loosened, or unsoldered.</p> <p>Are antenna connector ports in good condition?</p>	Yes	Go to step 12.		
		No	Replace AirPort card. Verify issue resolved.	N14	WIRELESS DEVICE
12.	<p>Reassemble display clutch barrel and reinstall clamshell on computer. Verify AirPort performance and reliability by starting up from known-good original system media or an up-to-date, bootable OS X volume. Connect to a known-good wireless network and download a large file from a website or file server. Compare performance to another known-good computer of similar type and AirPort specification. Verify throughput using Activity Monitor &gt; Network.</p> <p>Are performance and throughput comparable between user's computer and a known-good computer?</p>	Yes	AirPort performance is within specification. Verify issue resolved.		
		No	Replace AirPort antenna. Verify issue resolved.	X03	OTHER ELECTRIC

	Check	Result	Action	Code	Commodity
13.	<ul style="list-style-type: none"> <li>Connect to a known-good wireless network, and retest data throughput, checking for adequate transfer speeds.</li> <li>Verify wireless connection is sustained for several minutes.</li> </ul> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	N99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Bluetooth Card Not Recognized

## Unlikely causes:

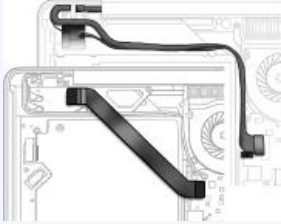

Battery, bottom case, fan, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, top case, trackpad

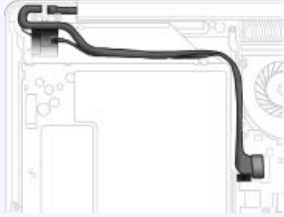
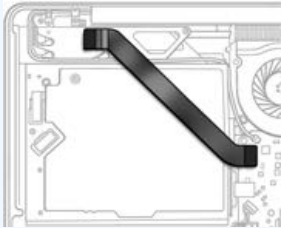
## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Bluetooth cannot be enabled.</li><li>Bluetooth card not available or recognized.</li><li>Bluetooth intermittently becomes disabled.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>In System Preferences, make sure Bluetooth setting is available.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Check for and apply latest software and firmware updates.</li><li>Start up from known-good original system media or an up-to-date, bootable OS X volume and verify In System Preferences that Bluetooth setting is available.</li></ol>

## Deep Dive


	Check	Result	Action	Code	Commodity
1.	Verify that internal Bluetooth card is detected in System Information (System Profiler in Snow Leopard) > Hardware > USB, or when running Mac Resource Inspector (MRI).	Yes	Go to step 2.		
	Does System Information or MRI detect the Bluetooth hardware?	No	Go to step 3.		
2.	Open and close display clamshell fully several times to make sure cables are not pinched or shorting, and then retest with MRI or recheck System Information.	Yes	Verify issue resolved.		
	Does System Information or MRI detect camera, Bluetooth, and ALS?	No	Go to step 3.		



	Check	Result	Action	Code	Commodity
3.	Depending on computer model, Bluetooth card might be either located near display hinge or embedded inside display clamshell. Use the pictures to identify which design is applicable.	Bluetooth Card Near Hinge	Go to step 7.		
	<b>Bluetooth card near hinge:</b> 	Bluetooth Card Inside Display Clamshell	Go to step 4.		
	<b>Bluetooth card inside display clamshell:</b> 				
	Which design applies to computer?				
4.	Camera, ambient light sensor (ALS), and Bluetooth are all located in display clamshell and share the same cable connection to the logic board via the camera cable. Unplug and inspect camera cable and connector for pinched wires or connector damage.	Yes	Camera cable is part of display clamshell. Replace display clamshell. Transfer user's AirPort card. Verify issue resolved.	L14	LCD
	Does camera cable show any damage?	No	Go to step 5.		
5.	With camera cable unplugged, inspect logic board connector for housing or pin damage.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
	Does camera connector on logic board show any damage?	No	Go to step 6.		
6.	Reseat camera cable to logic board. Retest with MRI or recheck in System Information.	Yes	Issue resolved by reseating camera cable. Verify resolution.		
	Does System Information or MRI detect camera, Bluetooth, and ALS?	No	Go to step 24.		

	Check	Result	Action	Code	Commodity
7.	<p>Depending on computer model, Bluetooth card may be a standalone Bluetoothcard (with one antenna) or an AirPort/Bluetooth combo card (with two or three antennas). Use the pictures to identify which design is applicable.</p> <p><b>Standalone Bluetooth card:</b></p>  <p><b>AirPort/Bluetooth combo card:</b></p>  <p>Which design applies to computer?</p>	Standalone Bluetooth Card	Go to step 8.		
		AirPort/Bluetooth Combo Card	Go to step 15.		
8.	<p>Camera, ambient light sensor (ALS), and Bluetooth all share the same connection to the logic board via the camera cable. Bluetooth card is connected at the middle the of camera cable. Unplug and inspect cable and connector to Bluetooth card for pinched wires or connector damage.</p> <p>Does camera cable or its connector to Bluetooth card show any damage?</p>	Yes	<p>Camera cable is part of display clamshell. Replace display clamshell.</p> <p>Transfer user's AirPort card. Verify issue resolved.</p>	L14	LCD
		No	Go to step 9.		
9.	<p>With cable unplugged, inspect cable connector port on Bluetooth card for damage.</p> <p>Does connector on Bluetooth card show any damage?</p>	Yes	Replace Bluetooth card. Verify issue resolved.	N17	WIRELESS DEVICE
		No	Go to step 10.		
10.	<p>Unplug camera cable from logic board and inspect cable and connector for pinched wires or connector damage.</p> <p>Does camera cable show any damage?</p>	Yes	<p>Camera cable is part of display clamshell. Replace display clamshell.</p> <p>Transfer user's AirPort card. Verify issue resolved.</p>	L14	LCD
		No	Go to step 11.		
11.	<p>With camera cable unplugged, inspect cable connector port on logic board for housing or pin damage.</p> <p>Does camera cable connector port on logic board show any damage?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 12.		

	Check	Result	Action	Code	Commodity
12.	Reseat cable on Bluetooth card and reseat camera cable on logic board. Test with MRI or check System Information.	Yes	Issue resolved by reseating Bluetooth card or camera cable connections. Verify resolution.		
	Does System Information or MRI detect camera, Bluetooth, and ALS?	No	Go to step 13.		
13.	To troubleshoot this issue completely, a known-good Bluetooth card is required.	Yes	Go to step 14.		
	Do you have immediate access to a known-good Bluetooth card?	No	Replace Bluetooth card. Verify issue resolved.	N15	WIRELESS DEVICE
14.	Substitute known-good Bluetooth card and test with MRI or check System Information.	Yes	Replace Bluetooth card. Verify issue resolved.	N15	OTHER ELECTRIC
	Does System Information or MRI detect camera, Bluetooth, and ALS?	No	Go to step 24.		
15.	AirPort/Bluetooth card is connected via a flex cable to logic board. Unplug flex cable and inspect AirPort/Bluetooth cable connector for pinched wires or connector damage.	Yes	Replace AirPort/Bluetooth flex cable.	X03	INTERNAL CABLE
	Does AirPort/Bluetooth connector on flex cable show any damage?	No	Go to step 16.		
16.	With cable unplugged, inspect AirPort/Bluetooth cable connector port on logic board for housing or pin damage.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
	Does AirPort/Bluetooth connector on logic board show any damage?	No	Go to step 17.		
17.	Peel back any tape covering flex cable connection on AirPort/Bluetooth card. Disconnect flex cable from AirPort/Bluetooth card. Inspect cable connector for pinched wires or connector damage.	Yes	Replace AirPort Bluetooth flex cable.	X03	INTERNAL CABLE
	Does AirPort/Bluetooth flex cable or connector show any damage?	No	Go to step 18.		
18.	With cable unplugged, inspect cable connector port on AirPort/Bluetooth card for damage.	Yes	Replace AirPort/Bluetooth card.	N17	WIRELESS DEVICE
	Does connector on AirPort/Bluetooth card show any damage?	No	Go to step 19.		
19.	Reseat AirPort/Bluetooth flex cable connections on both cards and on logic board. Retest with MRI or recheck in System Information.	Yes	Issue resolved by reseating AirPort/Bluetooth flex cable. Verify resolution.		
	Does System Information or MRI detect camera, Bluetooth, and ALS?	No	Go to step 20.		



	Check	Result	Action	Code	Commodity
20.	To troubleshoot this issue completely, the following known-good parts are required: <ul style="list-style-type: none"> <li>AirPort/Bluetooth flex cable</li> <li>AirPort/Bluetooth card</li> <li>Logic board</li> </ul> Do you have immediate access to each of these known-good parts?	Yes	Go to step 21.		
		No	Replace AirPort/Bluetooth flex cable. Verify issue resolved.	X03	INTERNAL CABLE
21.	Substitute a known-good AirPort/Bluetooth flex cable and retest with MRI or recheck System Information.	Yes	Replace AirPort/Bluetooth flex cable. Verify issue resolved.	X03	INTERNAL CABLE
	Does System Information or MRI detect Bluetooth and AirPort?	No	Go to step 22.		
22.	Substitute a known-good AirPort/Bluetooth card and retest with MRI or recheck System Information.	Yes	Replace AirPort/Bluetooth card. Verify issue resolved.	N15	WIRELESS DEVICE
	Does System Information or MRI detect Bluetooth and AirPort?	No	Go to step 23.		
23.	Substitute a known-good logic board and retest with MRI or recheck System Information.  Does System Information or MRI detect camera, Bluetooth, and ALS?	Yes	Replace logic board. Verify issue resolved.	M36	MLB
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
24.	To troubleshoot this issue completely, the following known-good parts are required: <ul style="list-style-type: none"> <li>Display clamshell</li> <li>Logic board</li> </ul> Do you have immediate access to each of these known-good parts?	Yes	Go to step 25.		
		No	Replace display clamshell. Transfer user's AirPort card. Verify issue resolved.	L23	LCD
25.	Substitute a known-good display clamshell and test with MRI or check System Information.	Yes	Replace display clamshell. Remember to transfer user's AirPort card. Verify issue resolved.	L23	LCD
	Does System Information or MRI detect camera, Bluetooth, and ALS?	No	Go to step 26.		

	Check	Result	Action	Code	Commodity
26.	Substitute a known-good logic board and retest with MRI or recheck System Information.  Does System Information or MRI detect camera, Bluetooth, and ALS?	Yes	Replace logic board. Verify issue resolved.	M36	MLB
		No	  <b>ESCALATION REQUIRED.</b>  Contact TSPS for additional support or a multiple-part repair.  Click Help button in GSX toolbar. Select Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	
27.	<ul style="list-style-type: none"> <li>Run MRI to verify that AirPort, Bluetooth, camera, and ALS are detected.</li> <li>Download and run latest version of Bluetooth Service Diagnostic (BSD) to verify Bluetooth functions.</li> </ul> Is issue resolved?	Yes	Issue resolved.		
		No	  <b>ESCALATION REQUIRED.</b>  Contact TSPS for additional support or a multiple-part repair.  Click Help button in GSX toolbar. Select Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Bluetooth Device Connection Issues

## Unlikely causes:

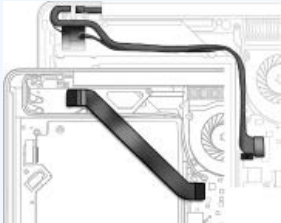
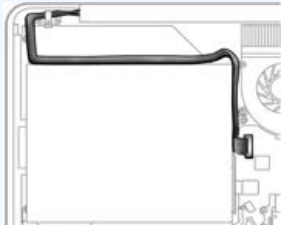
Battery, bottom case, fan, hard drive, heat sink, logic board, MagSafe board, memory, optical drive, power adapter, speakers, trackpad

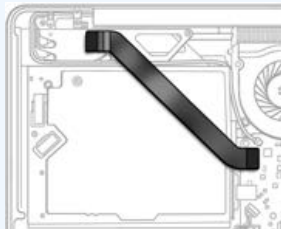

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Bluetooth can be enabled, but computer won't pair with known-good Bluetooth keyboard, mouse, or trackpad.</li><li>Paired Bluetooth devices intermittently lose their connections.</li><li>Data transfer over Bluetooth times out or is too slow.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>In System Preferences, make sure Bluetooth is on and set to Discoverable.</li><li>Attempt to pair computer with known-good Bluetooth keyboard, mouse, or trackpad.</li><li>Reset Bluetooth device or delete pairing (if applicable).</li><li>Verify integrity of user's Bluetooth device with a known-good computer, using Apple Support article <a href="#">TS3048: Troubleshooting wireless mouse and keyboard issues</a>.</li><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Check for and apply latest software and firmware updates.</li><li>If Bluetooth pairs normally at your service location, research potential sources of interference in user's environment, such as microwave ovens or cordless phones in 2.4/5GHz range. See Apple Support article <a href="#">HT1365: AirPort and Bluetooth: Potential sources of wireless interference</a>.</li></ol>



## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check Mac Resource Inspector (MRI) test results or System Information (System Profiler in Snow Leopard) > Hardware > USB to verify Bluetooth card is recognized.  Does System Information or MRI detect Bluetooth hardware?	Yes	Go to step 2.		
		No	Go to "Bluetooth Card Not Recognized" troubleshooting flow.		
2.	Open System Preferences > Bluetooth. Remove all paired devices. Pair computer with known-good Bluetooth device. Run latest version of Bluetooth Service Diagnostic (BSD) while actively paired with known-good device.  Does computer pass BSD tests?	Yes	Computer appears to be performing to specifications when paired with a known-good Bluetooth device. Suspect user's Bluetooth device.  Go to "I/O Devices: External Apple Bluetooth Peripherals" troubleshooting flow.		
		No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	Start up from known-good original system media or up-to-date, bootable OS X volume. Try to connect to a known-good Bluetooth device. Compare Bluetooth performance and reliability to a known-good computer of similar type and Bluetooth specification.	Yes	Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> . Restore computer to correct build of OS X. Verify resolution.		
	Is pairing issue resolved and Bluetooth performance comparable between user's computer and known-goo	No	Go to step 4.		
4.	Depending on computer model, Bluetooth card might be located near display hinge or embedded inside display clamshell. Use the pictures to identify which design is applicable.  <b>Bluetooth card near hinge:</b>  	Bluetooth Card Near Hinge	Go to step 5.		
	<b>Bluetooth card inside display clamshell:</b>    Is Bluetooth card located near display hinge or inside display clamshell?	Bluetooth Card Inside Display Clamshell	Bluetooth card and antenna are part of display clamshell. Replace display clamshell. Verify issue resolved.	L16	LCD

	Check	Result	Action	Code	Commodity
5.	Depending on computer model, Bluetooth card may be an AirPort/Bluetooth combo card (two or three antennas) or a small, standalone Bluetoothcard (with one antenna). Use the pictures to identify which design is applicable.	AirPort/Bluetooth Combo Card	Go to step 6.		
	<b>AirPort/Bluetooth combo card:</b> 	Standalone Bluetooth Card	Go to step 12.		
	<b>Standalone Bluetooth card:</b> 				
Which design applies to computer?					
6.	Locate rightmost Bluetooth antenna connection on AirPort/Bluetooth card. Unplug it and inspect antenna cable and its connector for any signs of pinched wires or connector damage.	Yes	Bluetooth antenna is part of display clamshell. Replace display clamshell. Verify issue resolved.	L18	LCD
	Does antenna cable or connector show signs of damage?	No	Go to step 7.		
7.	With cable unplugged, inspect AirPort/Bluetooth cable connector on logic board for housing or pin damage.	Yes	Replace AirPort/Bluetooth card. Verify issue resolved.	N17	WIRELESS DEVICE
	Does antenna connector on AirPort/Bluetooth card show signs of damage?	No	Go to step 8.		
8.	Reseat antenna cable connection on AirPort/Bluetooth card. Retry pairing with known-good Bluetooth device.	Yes	Issue resolved by reseating antenna to AirPort/Bluetooth card. Verify resolution.		
	Does pairing with known-good Bluetooth device succeed?	No	Go to step 9.		
9.	To troubleshoot this issue completely, the following known-good parts are required:	Yes	Go to step 10.		
	<ul style="list-style-type: none"><li>AirPort/Bluetooth card</li><li>Top case</li></ul> Do you have immediate access to each of these known-good parts?	No	Replace AirPort/Bluetooth card. Verify issue resolved.	N15	WIRELESS DEVICE

	Check	Result	Action	Code	Commodity
10.	Substitute a known-good AirPort/Bluetooth card, and then retry pairing with a known-good Bluetooth device.	Yes	Replace user's AirPort/Bluetooth card. Verify issue resolved.	N15	WIRELESS DEVICE
	Does pairing with known-good Bluetooth device succeed?	No	Go to step 11.		
11.	Bluetooth antenna is part of top case. Connect a Bluetooth antenna from known-good top case. Retry pairing with known-good Bluetooth device.	Yes	Replace user's top case. Verify issue resolved.	K07	KEYBOARD
	Does pairing with known-good Bluetooth device succeed?	No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
12.	Unplug and inspect antenna cable and its connector for any signs of pinched wires or connector damage.	Yes	Bluetooth antenna is part of top case. Replace top case. Verify issue resolved.	K16	KEYBOARD
	Does antenna cable or connector show signs of damage?	No	Go to step 13.		
13.	With cable unplugged, inspect Bluetooth card antenna connector for housing or pin damage.	Yes	Replace Bluetooth card. Verify issue resolved.	N17	WIRELESS DEVICE
	Does antenna connector on Bluetooth card show signs of damage?	No	Go to step 14.		
14.	Reseat antenna cable connection on Bluetooth card. Retry pairing with known-good Bluetooth device.	Yes	Issue resolved by reseating antenna to Bluetooth card. Verify resolution.		
	Does pairing with known-good Bluetooth device succeed?	No	Go to step 15.		
15.	To troubleshoot this issue completely, the following known-good parts are required:	Yes	Go to step 16.		
	<ul style="list-style-type: none"> <li>• Bluetooth card</li> <li>• Top case</li> </ul> <p>Do you have immediate access to each of these known-good parts?</p>	No	Replace Bluetooth card. Verify issue resolved.	N15	WIRELESS DEVICE
16.	Substitute a known-good Bluetooth card. Try pairing with a known-good Bluetooth device.	Yes	Replace user's Bluetooth card. Verify issue resolved.	N15	WIRELESS DEVICE
	Does pairing with known-good Bluetooth device succeed?	No	Go to step 17.		

	Check	Result	Action	Code	Commodity
17.	<p>Bluetooth antenna is part of top case. Connect a Bluetooth antenna from known-good top case. Try pairing with known-good Bluetooth device.</p> <p>Does pairing with known-good Bluetooth device succeed?</p>	Yes	Replace user's top case. Verify issue resolved.	K07	KEYBOARD
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
18.	<ul style="list-style-type: none"> <li>Download and run latest version of Bluetooth Service Diagnostic (BSD) to verify Bluetooth functionality.</li> <li>Pair with a known-good Bluetooth device and verify connection is sustained for several minutes.</li> </ul> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Ethernet Issues

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, top case, trackpad

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>No Ethernet device present</li><li>Unable to access Ethernet network resources</li><li>Ethernet device shows no connection</li><li>Ethernet device unable to get an IP address</li><li>Slow Ethernet network performance</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Verify network setup by accessing it directly via a known-good computer's Ethernet port.</li><li>Check System Information (System Profiler in Snow Leopard) &gt; Network. Select "Network" to verify that Ethernet is listed as an active service.</li><li>Connect to known-good network hardware with known-good Ethernet cable (Cat 5 or better is recommended for 100+ Mbps connections).</li><li>Start up from a known-good OS X volume. Go to Network Utility &gt; Info and verify that Link Status is "Active."</li><li>Connect to known-good DHCP network. Check System Preferences &gt; Network &gt; Ethernet. Set the Configure IPv4 menu to "Using DHCP." Verify IP address. (If it begins with 169.x.x.x, computer was unable to get a valid IP address.) See Apple Support article <a href="#">TS3798: Internet connection does not work with an IP address space of 169.254.XXX.XXX for ISP, router or manual configuration</a>.</li><li>Start up from user's OS. Revert to default network settings by creating a new location in System Preferences &gt; Network.</li><li>Check for and apply latest software and firmware updates.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect Ethernet port for dust, debris, damage, or bent pins. Use compressed air to remove debris. Plug in a known-good Ethernet cable and make sure all pins make physical contact with connector.	Yes	Go to step 2.		
	Are any Ethernet port pins damaged or making insufficient contact with known-good RJ-45 connector?	No	Go to step 4.		
2.	Inspect logic board, Ethernet port, and enclosure for dents, scratches, or other indications of impact or abuse.	Yes	Go to step 3.		
	Does accidental damage appear to be cause of issue?	No	Replace logic board. Verify issue resolved.	M10	MLB



	Check	Result	Action	Code	Commodity
3.	Using Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a> as a guide, inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options. Refer to <a href="#">OP18: SERVICE: Accidental Damage Repair Pricing for Mail-In Notebooks and Displays</a> for pricing.	Yes	Replace logic board. Verify issue resolved.	M10	MLB
		No	Issue resolved. Return computer to user using correct positioning.		
	Does the user want to proceed with out-of-warranty repair?				
4.	In System Preferences > Network > Ethernet, verify that link status is "Connected" (green dot) and that a valid IP address is listed. Connect computer to an Ethernet network with a known-good DHCP server. Make sure static DHCP maps or filtering are not preventing address allocation.  <b>Note:</b> DHCP allocation may not be instantaneous, depending on the network. Retest.	Yes	Go to step 5.		
		No	Replace logic board. Verify issue resolved.	M10	MLB
	Is Ethernet link status active?				
5.	Go to System Preferences > Network > Ethernet and obtain Router IP address. Use Network Utility to ping Router IP address. Use a simple hub/switch environment.  Is Network Utility able to ping Router IP address?	Yes	No performance or connectivity issues detected. No repair necessary. Issue may be network environment. Refer user to Apple Support article <a href="#">TS1317: Mac OS X: Troubleshooting a cable modem, DSL, or LAN Internet connection</a> .		
		No	Go to step 6.		
6.	Perform network testing from previous step, using same cable and network, but with a known-good computer.  Is network performance of user's computer inferior to known-good computer?	Yes	Replace logic board. Verify issue resolved.	M10	MLB
		No	No performance or connectivity issues detected. No repair necessary. Issue may be network environment. Refer user to Apple Support article <a href="#">TS1317: Mac OS X: Troubleshooting a cable modem, DSL, or LAN Internet connection</a> .		

	Check	Result	Action	Code	Commodity
7.	<ol style="list-style-type: none"> <li>1. Connect Ethernet cable to a known-good network with a DHCP server.</li> <li>2. In System Preferences &gt; Network &gt; Ethernet, verify the link status is "Connected" (green dot).</li> <li>3. Configure TCP/IP settings to "Using DHCP" and check that a valid IP address is obtained from the server (not a self-assigned one starting with 169.x.x.x).</li> <li>4. Launch the web browser and verify that you can access websites and download files.</li> </ol> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# Thunderbolt Ethernet Adapter Connectivity Issues

## Unlikely causes:


N/A


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>• No Ethernet present in Network preferences.</li><li>• Unable to access Ethernet network resources.</li><li>• Ethernet shows no active link or connection.</li><li>• Ethernet intermittently drops connection.</li><li>• Ethernet unable to get an IP address.</li><li>• Slow Ethernet network performance.</li></ul> <p><b>NOTE:</b> These symptoms address issues with the Thunderbolt Ethernet Adapter, not the computer's Thunderbolt port. If you suspect an issue with the computer after attempting Quick Check steps that follow, please back up and click on the 'Troubleshoot another issue' button to select a functional area and issue that addresses issues with computer's Thunderbolt port instead.</p> <p><b>NOTE:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>1. Verify network setup by accessing it directly via an Ethernet port on a known-good computer.</li><li>2. Check System Information. Verify Ethernet port presence in System Information &gt; Hardware &gt; Ethernet Cards. Verify Ethernet adapter presence in System Information &gt; Hardware &gt; Thunderbolt.</li><li>3. Try known-good Ethernet adapter, network hardware and Ethernet cable and user's computer.</li></ol> <p><b>Note:</b> Cat 5 or better is recommended for 100+ Mbps connections.</p> <ol style="list-style-type: none"><li>4. Using a known-good Ethernet adapter, network hardware and cable, start up from a known-good OS X volume or Lion Recovery Partition. Go to Network Utility &gt; Info and verify Link Status is "Active."</li><li>5. Check network settings. If a known-good DHCP server is available, set System Preferences &gt; Network &gt; Ethernet to "Using DHCP." Verify IP address.</li></ol> <p><b>Note:</b> If the IP address begins with 169.x.x.x, the system was unable to get a valid IP address. See one of the following Apple Support articles:</p> <ul style="list-style-type: none"><li>• <a href="#">PH3856: OS X Lion: Renew an IP address from the DHCP server.</a></li><li>• <a href="#">PH6592: Mac OS X 10.6: Renewing an IP address from the DHCP server.</a></li></ul> <ol style="list-style-type: none"><li>6. Start up from user's OS. Revert to default network settings by creating a new location in System Preferences &gt; Network.</li><li>7. Check for and apply the latest software and firmware updates.</li></ol>



## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect both connectors, cable, and body of Thunderbolt Ethernet Adapter. Check for dust, debris, damage, bent pins, or other indications of accidental damage. Use compressed air to remove debris.	Yes	Go to step 2.		
		No	Go to step 3.		
	Did you find any damaged components?				

	Check	Result	Action	Code	Commodity
2.	Using Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a> as a guide, inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare.	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X26	EXTERNAL CABLE
	If applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP18: SERVICE: Accidental Damage Repair Pricing for Mail-In Portables and Displays</a> for pricing.  Does user want to proceed with out-of-warranty repair?	No	Issue resolved. Return computer to user using correct positioning.		
3.	Connect user's Thunderbolt Ethernet Adapter to an available Thunderbolt port on user's computer. Start up computer completely and launch System Information.	Yes	Go to step 6.		
	Verify Ethernet port presence in System Information > Hardware > Ethernet Cards.  Verify Ethernet adapter presence in System Information > Hardware > Thunderbolt.  Does user's Thunderbolt Ethernet Adapter appear in both areas of System Information?	No	Go to step 4.		
4.	To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.	Yes	Go to step 5.		
	Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?	No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
5.	Connect a known-good Thunderbolt Ethernet Adapter to user's computer to verify adapter presence.	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
	Verify Ethernet port presence in System Information > Hardware > Ethernet Cards.  Verify Ethernet adapter presence in System Information > Hardware > Thunderbolt.  Does known-good Thunderbolt Ethernet Adapter now appear in both areas of System Information?	No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

	Check	Result	Action	Code	Commodity
6.	Connect user's Thunderbolt Ethernet Adapter to an available Thunderbolt port on user's computer.	Yes	Go to step 9.		
	<p>Connect adapter's RJ-45 port to an Ethernet network with a known-good DHCP server using a known-good Cat 5 or better Ethernet cable. Start up computer completely.</p> <p>In System Preferences &gt; Network &gt; Ethernet, verify link status is "Connected" (green dot) and a valid IP address is listed. Make sure static DHCP maps or filtering are not preventing address allocation.</p> <p><b>Note:</b> DHCP allocation may not be instantaneous, depending on the network. Retest.</p> <p>Is Ethernet link status active?</p>	No	Go to step 7.		
7.	To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.	Yes	Go to step 8.		
	Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?	No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
8.	Connect known-good Thunderbolt Ethernet Adapter to an available Thunderbolt port on user's computer. Connect adapter to known-good DHCP server using a Cat 5 or better Ethernet cable.	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
	<p>Start up computer. In System Preferences &gt; Network &gt; Ethernet, verify link status is "Connected" (green dot) and a valid IP address is listed.</p> <p>Is Ethernet link status now active?</p>	No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
9.	Check network connection on user's computer with known-good cable and network, and user's Thunderbolt Ethernet Adapter.	Yes	Go to step 12.		
	<p>Go to System Preferences &gt; Network &gt; Ethernet and obtain Router IP address.</p> <p>Use Network Utility to ping Router IP address. Use a simple hub/switch environment.</p> <p>Is Network Utility able to ping Router IP address?</p>	No	Go to step 10.		

	Check	Result	Action	Code	Commodity
10.	To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.	Yes	Go to step 11.		
	Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?	No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
11.	Check network connection on user's computer with known-good Thunderbolt Ethernet Adapter, cable and network.	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
	Go to System Preferences > Network > Ethernet and obtain Router IP address. Use Network Utility to ping Router IP address. Use a simple hub/switch environment.  Is Network Utility now able to ping Router IP address?	No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
12.	Continue to use Network Utility to ping Router IP address. Use a simple hub/switch environment. Verify connection does not randomly disconnect (seen as packet loss during pings).	Yes	Go to step 15.		
	In System Preferences > Network > Ethernet, verify link status is consistently active throughout testing.  Is Network Utility able to ping Router IP address consistently, with no packet loss?	No	Go to step 13.		
13.	To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.	Yes	Go to step 14.		
	Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?	No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
14.	<p>Check network performance on user's computer with known-good Thunderbolt Ethernet Adapter, cable and network.</p> <p>Continue to use Network Utility to ping Router IP address. Verify connection does not randomly disconnect (seen as packet loss during pings).</p> <p>In System Preferences &gt; Network &gt; Ethernet, verify link status is consistently active throughout testing.</p> <p>Is Network Utility able to ping Router IP address consistently, with no packet loss?</p>	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X03	
15.	<p>Connect user's Ethernet Adapter and cable to a known-good computer on same network. Continue to use Network Utility to ping Router IP address.</p> <p>In System Preferences &gt; Network &gt; Ethernet, verify link status is consistently active throughout testing.</p> <p>Is network performance of user's adapter inferior when used with a known-good computer?</p>	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	<p>No performance or connectivity issues detected. No repair necessary. The problem may be network environment.</p> <p>Refer user to Apple Support article <a href="#">TS1317: Mac OS X: Troubleshooting a cable modem, DSL, or LAN Internet connection.</a></p>		
16.	<ol style="list-style-type: none"> <li>1. Connect Ethernet cable to a known-good network with a DHCP server.</li> <li>2. In System Preferences &gt; Network &gt; Ethernet, verify the link status is "Connected" (green dot).</li> <li>3. Configure TCP/IP settings to "Using DHCP" and check that a valid IP address is obtained from server (not a self-assigned one starting with 169.x.x.x).</li> <li>4. Launch web browser and verify access to websites and download files.</li> </ol> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Backlight Issue / No Backlight

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, fan, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, top case, trackpad



## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Display not illuminated.</li><li>Flickering, unstable, or non-uniform background lighting.</li><li>Poor backlight at some or all settings.</li><li>Computer exhibits power, sleep LED, Power-On Self Test (POST) chime, and fan movement.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check for and apply the latest software and firmware updates.</li><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.</li><li>Reset the SMC using the procedure listed for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>Adjust the brightness to the maximum setting, using F2 key.</li><li>Put the computer to sleep by pressing the Control/Shift/Eject keys. Wake it by pressing any key.</li><li>If computer has a repair history, check that the AirPort flex cable connector is correctly oriented in its slot on the AirPort card.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Connect an external display. Check to see if external display mirrors backlight issue or shows any video at all.	Yes	Go to step 2.		
	Does external display show a video signal of any kind?	No	Go to “Power But Blank/No Video” troubleshooting flow.		
2.	Check Mac Resource Inspector (MRI) results to verify LCD is detected. You can use Gateway Manager to access log files on the Apple Service Toolkit (AST) server if there is no video image. Consult the AST Reference Guide for more information on using Gateway Manager.	Yes	Go to step 3.		
	If MRI is not available, go to System Information (System Profiler in Snow Leopard) > Hardware > Graphics/Displays to verify LCD presence.  Does MRI or System Information detect the LCD?	No	Go to “Power But Blank/No Video” troubleshooting flow.		
3.	Shine a flashlight through the Apple logo on back of display housing to check for an intact video signal, even if faint.	Yes	Go to step 4.		
	Check for an Apple logo during startup or the OS X desktop after startup.  Does the display show a video signal despite not being backlit?	No	Go to “Power But Blank/No Video” troubleshooting flow.		



	Check	Result	Action	Code	Commodity
4.	Inspect display flex cable while reseating LVDS cable connector on logic board. Even if the connection looks good, there is a chance a cable reseal can restore display backlight.	Yes	Issue resolved. Verify Resolution.		
	Make sure the EMI sponge on the connector is correctly placed; otherwise it may short out data signals, disabling the backlight.	No	Go to step 5.		
	Is backlight functionality restored?				
5.	Using magnification, inspect LVDS cable for pinching and inspect cable connectors on both cable and logic board for damaged or defective pins.	Yes	Go to step 6.		
		No	Go to step 7.		
	Did you find cable or connector damage?				
6.	Determine whether damage or defect is located on LVDS cable, logic board, or both.	Yes	 <b>ESCALATION REQUIRED.</b> <b>Multiple-part repair:</b> Contact TSPS. Click the Help button in the GSX toolbar > Technical Help with a Repair > Contact Apple.	M99	
	Are both LVDS cable and LVDS connector on logic board damaged?	No	Go to step 9.		
7.	Locate backlight fuse on logic board using Apple Support article <a href="#">OP478: Portables: F9800 fuse location images</a> . Test fuse continuity using a multimeter. For instruction on using a multimeter, see Apple Support article <a href="#">HT3250: Using a Digital Multimeter</a> .	Yes	 <b>ESCALATION REQUIRED.</b> <b>Multiple-part repair:</b> Contact TSPS. Click the Help button in the GSX toolbar > Technical Help with a Repair > Contact Apple.	M99	
	Is fuse burned out?	No	Go to step 8.		
8.	To troubleshoot this issue completely, a known-good logic board is required.	Yes	Go to step 10.		
	Do you have immediate access to a known-good logic board?	No	Replace logic board. Verify issue resolved.	M25	MLB
9.	Determine which connector is damaged or defective: LVDS flex cable or LVDS connector on logic board.	Cable	Replace display clamshell. Verify issue resolved.	L09	LCD
	Which connector is damaged or defective: cable or logic board?	Logic Board	Replace logic board. Verify issue resolved.	M25	MLB

	Check	Result	Action	Code	Commodity
10.	Substitute a known-good logic board and retest backlight function.	Yes	Replace logic board. Verify issue resolved.	M25	MLB
	Is backlight functionality restored?	No	Replace display clamshell. Reinstall user's logic board. Verify issue resolved.	L09	LCD
11.	Restart the computer and verify that both video and backlight are functioning normally.  Is the issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Power But Blank/No Video

## Unlikely causes:


AirPort/Bluetooth card(s), battery, bottom case, fans, hard drive, heat sink, optical drive, power adapter, top case, trackpad

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Power available, but no video visible on display.</li><li>Fan, hard drive spin, or optical drive reset sounds are audible.</li><li>Sleep indicator light illuminates during startup.</li><li>Caps Lock key illuminates when pressed.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Press F2 key to increase screen brightness.</li><li>Reset SMC using procedure listed for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>Disconnect ThunderBolt cable, Firewire, and USB devices where applicable.</li></ol>



## Deep Dive


	Check	Result	Action	Code	Commodity
1.	Connect external display and start up computer. Observe sleep indicator light to verify that it illuminates on startup and then goes off when LCD panel or external display becomes active. Closing display clamshell will force the desktop to external display. Try both methods of open and closed display clamshell to verify system graphics controller is driving a display.	Yes	Go to step 2.		
	Did sleep indicator light go off as external display became active?	No	Go to step 26.		
2.	Verify video signal appears on external display.	Yes	Go to step 5.		
	Does video appear on external display?	No	Go to step 3.		
3.	Reseat memory modules securely in their slots.	Yes	Go to step 5.		
	Does video appear on external display?	No	Go to step 4.		
4.	Install known-good memory. If known-good memory is unavailable, perform DIMM isolation testing. Remove one DIMM, test, swap, then retest. Test both memory slots to determine if one or both sockets are bad, indicating a defective logic board. Start up computer.	Yes	Replace defective memory module(s). Verify issue resolved.	X02	MEMORY
	Does video appear on both external and internal displays?	No	Replace logic board. Verify issue resolved.	M03	MLB

	Check	Result	Action	Code	Commodity
5.	Restart computer. On a display with dim or no backlight, shine an LED flashlight through Apple logo on the back of display clamshell to check for a video signal.  Do you see any signs of a video signal on internal display?	Yes	Go to “Backlight Issue / No Backlight” troubleshooting flow.		
		No	Go to step 6.		
6.	Restart computer. Watch for a video signal that briefly appears and then disappears. Check status of sleep indicator light.  Did display briefly show Apple logo, then go to sleep with sleep indicator light pulsing?	Yes	Go to step 13.		
		No	Go to step 7.		
7.	Attach external keyboard and mouse to computer. Start up computer and quickly close clamshell to force video to appear on external display. Once startup process is complete and Finder is loaded, open System Preferences > Displays.  Were you able to open Display Preferences via an external display?	Yes	Go to step 9.		
		No	Go to step 8.		
8.	With external keyboard and mouse still attached, restart computer with known-good original system media or an up-to-date, bootable OS X volume and quickly close display clamshell to force video to appear on the external display. Once startup process is complete and Finder is loaded, open System Preferences > Displays.  Were you able to open Display Preferences via an external display?	Yes	Go to step 9.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
9.	Open display clamshell on user's computer. In Display Preferences (using the external display interface), click Detect Displays. Wait ten seconds and click Detect Displays again. Then click Gather Windows button.  If the internal LCD display is available, a Color LCD window will appear on the desktop. Color LCD window should appear offset and behind external display window.  <b>Note:</b> Computer will not acknowledge internal LCD if display clamshell is closed.  Did a Color LCD window appear behind external display window?	Yes	Go to step 10.		
		No	Go to step 19.		

	Check	Result	Action	Code	Commodity
10.	In Display Preferences, make sure "Automatically adjust brightness" / "Automatically adjust brightness as ambient light changes" is unchecked. Adjust brightness to its full level.	Yes	Go to step 11.		
		No	Go to step 19.		
	Is video restored on the internal display?				
11.	Loss of even one of the synchronized video signals on an LCD display can show up as a variety of anomalies. Verify LCD panel is faulty by checking for flickering pixels, odd colors, vertical/horizontal lines, or blank screen portion(s).	Yes	Go to "Display Anomalies" troubleshooting flow.		
		No	Go to step 12.		
	Does the internal display have any of these display anomalies?				
12.	Change the brightness levels by pressing the F1 key several times and then the F2 key several times to see if the backlight changes with the fluctuation in brightness.	Yes	Go to "Backlight Issue / No Backlight" troubleshooting flow.		
		No	Issue resolved. Verify resolution.		
	Is the backlight dim, flickering, missing a portion of the screen or not functioning at all?				
13.	The sleep sensor may be stuck or its cable may be shorted, putting computer into display sleep during startup. Depending on computer configuration, this magnetic sleep sensor may either be on the front hard drive bracket with IR/Sleep cable, or on the sleep sensor/battery indicator light (BIL) cable. Identify sleep sensor connection on logic board.	Sleep sensor/BIL cable	Go to step 14.		
		Front Hard Drive Bracket With IR/Sleep cable	Go to step 16.		
	Where is the sleep sensor located?				
14.	A loose or defective cable or connector may force computer to sleep immediately after starting up to desktop. Inspect and reseal sleep sensor/BIL cable at logic board.	Yes	Issue resolved. Verify resolution.		
		No	Go to step 15.		
	Is video restored, no longer going to sleep after startup?				
15.	Disconnect sleep sensor/BIL cable at logic board.  Is video restored, no longer going to sleep after startup?	Yes	Replace sleep sensor/BIL cable assembly. Remount the cable assembly carefully into the top case, making sure the cable is properly installed. A tilted or damaged sleep sensor will not activate the sleep mode when the clamshell is closed. Verify issue resolved.	X03	OTHER ELECTRIC
		No	Replace logic board. Verify issue resolved.	M22	MLB

	Check	Result	Action	Code	Commodity
16.	A loose or defective cable or connector may force computer to sleep immediately after starting up to desktop. Inspect and reseal IR/sleep cable at logic board.  Is video restored, no longer going to sleep after startup?	Yes	Issue resolved. Verify resolution.		
		No	Go to step 17.		
17.	Disconnect IR/sleep cable at logic board.  Is video restored, no longer going to sleep after startup?	Yes	Go to step 18.		
		No	Replace logic board. Verify issue resolved.	M22	MLB
18.	Depending on computer configuration, the front hard drive bracket with IR/sleep cable may not be available to order separately.  Is computer a 17-inch portable?	Yes	IR/sleep cable is not available separately. Replace top case. Verify issue resolved.	K20	KEYBOARD
		No	Replace the front hard drive bracket with IR/sleep cable. Remount the cable assembly carefully into the top case, making sure the cable is properly installed. A tilted or damaged sleep sensor will not activate the sleep mode when the clamshell is closed. Verify issue resolved.	X03	OTHER ELECTRIC
19.	Reseat internal display cable connection to logic board.  Is video restored on internal display?	Yes	Issue resolved. Verify resolution.		
		No	Go to step 20.		
20.	Inspect display cable, its connector, and the logic board connector port for cracked housing, pinched or loose wires, or other signs of damage.  Are both display cable AND logic board connector damaged?	Yes	 <b>ESCALATION REQUIRED.</b>  Contact TSPS regarding a possible replacement of both the display clamshell and the logic board.	M99	
		No	Go to step 21		
21.	Check display cable and logic board connector port for damage.  Were any display cable/connector parts damaged?	Yes	Go to step 22.		
		No	Go to step 23.		MLB
22.	Determine which part is damaged: <ul style="list-style-type: none"><li>• Display cable and/or its connector</li><li>• Connector port on the logic board</li></ul> Which is damaged, display cable or logic board?	Logic board	Replace logic board. Verify issue resolved.	M24	MLB
		Display cable	Replace display clamshell. Verify issue resolved.	L14	LCD

	Check	Result	Action	Code	Commodity
23.	To troubleshoot this issue completely, a known-good display clamshell is required.  Do you have immediate access to a known-good clamshell?	Yes	Go to step 24.		
		No	Replace display clamshell. Verify issue resolved.	L03	LCD
24.	Substitute a known-good display clamshell and retest.  Is video restored?	Yes	Replace display clamshell. Verify issue resolved.	L03	LCD
		No	Go to step 25.		
25.	Using a digital multimeter, measure the resistance or continuity of the backlight fuse on logic board to ensure user's display won't damage replacement logic board. The meter should beep or show a low ohm reading (> 1 ohm) to indicate a working, or open, device. Refer to <a href="#">OP478: MacBook and MacBook Pro: F9800 fuse location images</a> or the Service Guide for locating the F9700 fuse. Refer to <a href="#">HT3250: Diagnostics: Using a digital multimeter</a> for how to use a digital multimeter.  Is fuse for backlight power open?	Yes	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
		No	Replace logic board. Reinstall user's display clamshell. Verify issue resolved.	M03	MLB
26.	Run Mac Resource Inspector (MRI) without external display. Utilize Gateway Manager to check if AST can boot and complete MRI to produce a log file for review. MRI may also report errors that prevent boot or LCD activation after Power-On Self Test (POST).  Pass or fail, has MRI log file indicated a complete test of the computer?	Yes	Go to step 27.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Computer may be experiencing a logic board hang during startup, prior to enabling video display.</p>	M99	
27.	Review MRI log file results to check if MRI reports errors for logic board, on board power supplies, CPU, or firmware and controller.  Has MRI reported errors related to logic board malfunctions?	Yes	Replace logic board. Verify issue resolved.	M03	MLB
		No	Go to step 28.		

	Check	Result	Action	Code	Commodity
28.	Review MRI log file results to check if MRI reports main memory-related errors.	Yes	Go to step 3.		
	Has MRI reported errors related to system main memory?	No	Go to step 29.		
29.	Review the MRI log file results to check if MRI confirmed LCD presence.	Yes	Go to step 10.		
	Has MRI indicated presence of the internal LCD display?	No	Go to step 19.		
30.	Restart the computer and verify that the video is fully functional.  Is the issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>		



# MacBook Pro (13-inch, 15-inch, Mid 2012): Camera Issues

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, fan, hard drive, heat sink, MagSafe board, memory, optical drive, speakers, SSD, top case, trackpad


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Camera not detected</li><li>• No green LED for camera</li><li>• Excessive blooming</li><li>• Poor white balance</li><li>• Poor focus</li><li>• Green image</li><li>• Image distortion</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>1. Check for and apply latest software and firmware updates.</li><li>2. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>3. Verify camera lens and glass panel are clear of contaminants.</li><li>4. Ask user about lighting conditions in his or her working environment. Dim lighting causes poor image quality. Overly bright lighting can bounce off surfaces onto subject and make image foggy.</li><li>5. Striped, textured, and mesh clothing can create moiré patterns in image.</li><li>6. Reset SMC using the procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>7. Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>8. Disconnect all USB devices and restart computer.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run Mac Resource Inspector (MRI) and check test results to verify LCD panel and camera presence.	Yes	Go to step 3.		
	<b>Note:</b> Some computer models will not show a camera test in MRI.	No	Go to step 2.		
	Does MRI detect camera and LCD panel?				
2.	Check System Information > Hardware > USB. Verify either “Built-in iSight” or “FaceTime HD Camera” is listed under USB High-Speed Bus.	Yes	Go to step 3.		
		No	Go to step 4.		
	Does camera appear in System Information?				
3.	Launch Photo Booth. Verify green LED next to camera lights up. Make sure image looks normal.	Yes	Issue resolved. Verify resolution.		
		No	Go to step 4.		
	Does camera LED light up and does image appear normal?				

	Check	Result	Action	Code	Commodity
4.	Inspect camera cable routing from display to logic board connector. Inspect cable for pinching or damage. Check connector for loose or broken wires or pins.	Yes	Replace display clamshell. Verify issue resolved.	L17	LCD
	<p><b>NOTE:</b> If an EMI gasket is present, position it away from logic board connector pins. Contact between gasket and connector pins can short out power and data signals, damaging the cable and logic board.</p> <p>Does camera cable show any signs of damage?</p>	No	Go to step 5.		
5.	Inspect camera cable connector on logic board. Look for a missing connector, cracked connector housing, or bent or broken pins that may have lifted from logic board solder pads.	Yes	Replace logic board. Verify issue resolved.	M13	MLB
	Does logic board connector show any signs of damage?	No	Go to step 6.		
6.	Reseat camera cable securely to logic board. Recheck if camera is now listed in System Information.	Yes	Go to step 7.		
	Does camera appear in System Information?	No	Go to step 8.		
7.	Launch Photo Booth. Verify green LED next to camera lights up. Make sure image looks normal.	Yes	Issue resolved by reseating camera cable. Verify resolution.		
	Does camera LED light up and does image appear normal?	No	Go to step 8.		
8.	To troubleshoot this issue completely, a known-good display clamshell is required.	Yes	Go to step 9.		
	Do you have immediate access to a known-good display clamshell?	No	Replace display clamshell. Verify issue resolved.	L17	LCD
9.	Substitute a known-good display clamshell. Recheck if camera is now listed in System Information.	Yes	Replace display clamshell. Verify issue resolved.	L17	LCD
	Does camera appear in System Information?	No	Replace logic board. Reinstall user's display clamshell. Verify issue resolved.	M13	MLB

	Check	Result	Action	Code	Commodity
10.	<p>Verify camera now functions as expected and its image quality is acceptable.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	L99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Display Anomalies

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, fan, hard drive, heat sink, MagSafe board, optical drive, power adapter, speakers, top case, trackpad

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Distorted/blurred image</li><li>• Vertical/horizontal lines</li><li>• Unstable flickering</li><li>• Pixel anomalies</li><li>• Incorrect or missing colors</li><li>• Non-uniform brightness</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>1. Isolate software by starting up from known-good original system media or an up-to-date, bootable OS X volume.</li><li>2. Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a>, and verify correct version and build of OS X is installed.</li><li>3. Check System Preferences &gt; Displays &gt; Color for possible use of a custom display profile. Set profile to Color LCD.</li><li>4. Check brightness setting.</li><li>5. Check for and apply latest software and firmware updates.</li><li>6. Clean glass panel and check for dust or debris.</li><li>7. Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>8. Reset SMC using procedure listed for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Compare an image on user's display with same image on an equivalent, known-good portable computer display.	Yes	Go to step 29.		
	Of the six issues below, verify that "distorted/blurred image" best describes the primary symptom. <ul style="list-style-type: none"><li>• <b>Distorted/blurred image</b></li><li>• Vertical/horizontal lines</li><li>• Unstable flickering</li><li>• Pixel anomalies</li><li>• Incorrect or missing colors</li><li>• Non-uniform brightness</li></ul>	No	Go to step 2.		
	Is a distorted or blurred image the primary display issue?				

	Check	Result	Action	Code	Commodity
2.	Compare an image on user's display with same image on an equivalent, known-good portable computer display.	Yes	Go to step 19.		
	<p>Of the five issues below, verify that "vertical/horizontal lines" best describes the primary symptom.</p> <ul style="list-style-type: none"> <li>• <b>Vertical/horizontal lines</b></li> <li>• Unstable flickering</li> <li>• Pixel anomalies</li> <li>• Incorrect or missing colors</li> <li>• Non-uniform brightness</li> </ul> <p>Are vertical or horizontal lines the primary display issue?</p>	No	Go to step 3.		
3.	Compare an image on user's display with same image on an equivalent, known-good portable computer display.	Yes	Go to "Unstable Flickering" troubleshooting flow.		
	<p>Of the four issues below, verify that "unstable flickering" best describes the primary symptom.</p> <ul style="list-style-type: none"> <li>• <b>Unstable flickering</b></li> <li>• Pixel anomalies</li> <li>• Incorrect or missing colors</li> <li>• Non-uniform brightness</li> </ul> <p>Is flickering the primary display issue?</p>	No	Go to step 4.		
4.	Use Apple Service Toolkit Test Pattern Tools (TPT) test to identify any pixel anomalies. Examine display using solid white, red, green, and blue screens to reveal bright and dark subpixel anomalies or foreign material trapped within the display.	Yes	Go to step 17.		
	<p>Refer to Apple Support article <a href="#">HT1721: About LCD display pixel anomalies for Apple products released before 2010</a> or <a href="#">HT4044: About LCD display pixel anomalies for Apple products released in 2010 and later</a> (depending on user's computer model) to determine if the number of defects exceeds specification.</p> <p>Of the three issues below, verify that "pixel anomalies" best describes the primary symptom</p> <ul style="list-style-type: none"> <li>• <b>Pixel anomalies</b></li> <li>• Incorrect or missing colors</li> <li>• Non-uniform brightness</li> </ul> <p>Are pixel anomalies the primary display issue?</p>	No	Go to step 5.		
5.	Compare an image on user's display with same image on an equivalent, known-good portable computer display. Verify that "incorrect or missing colors" best describes the primary symptom.	Yes	Go to step 9.		
	Is incorrect or missing colors the primary display issue?	No	Go to step 6.		


	Check	Result	Action	Code	Commodity
6.	Set desktop pattern in System Preferences > Desktop & Screen Saver > Desktop to “Solid Gray Light” to verify issue is non-uniform brightness.	Yes	Go to step 7.		
	Observe display behavior. Verify that “non-uniform brightness” best describes the primary symptom.  Is non-uniform brightness the primary display issue?	No	LCD seems to be within specifications. Do not replace display clamshell. Verify resolution.		
7.	Determine if variation in uniformity appears excessive when compared to a known-good, similar computer.	Yes	Go to step 8.		
	Does non-uniform brightness exceed that of a known-good computer?	No	LCD seems to be within specifications. Do not replace display clamshell. Verify resolution.		
8.	Reseat LVDS cable connector securely to logic board and retest.	Yes	Issue resolved by reseating LVDS cable. Verify issue resolution.		
	Is normal video restored?	No	Replace display clamshell. Verify issue resolved.	L07	LCD
9.	Verify display is listed in System Information > Hardware > Graphics/Displays > Video Card. This ensures that the color profile can be matched with the LCD.	Yes	Go to step 10.		
	Does display appear in System Information?	No	Go to step 11.		
10.	Go to System Preferences > Displays > Color to make sure “Color LCD” is selected under Display profile. Inspect display again for incorrect or missing colors.	Yes	Go to step 11.		
	Are colors still incorrect or missing when display profile is set to “Color LCD”?	No	Issue resolved by setting a valid display profile. User may have created an off-color calibration setting. Verify resolution.		
11.	Run Mac Resource Inspector (MRI) to check for LCD presence.	Yes	Go to step 13.		
	Is LCD detected (green) in MRI?	No	Go to step 12.		
12.	Reseat LVDS cable connector securely to logic board and retest.	Yes	Issue resolved by reseating LVDS cable. Verify resolution.		
	Is normal video restored?	No	Go to step 13.		
13.	Set desktop pattern in System Preferences > Desktop & Screen Saver > Desktop to “Solid Gray Light”.	Yes	Go to step 15.		
	Does incorrect/missing color issue affect entire screen?	No	Go to step 14.		

	Check	Result	Action	Code	Commodity
14.	Put computer side-by-side with a known-good, equivalent portable display showing the same “Solid Gray Light” image.	Yes	Go to step 15.		
	Is issue noticeably worse on user’s display?	No	Small variations in color uniformity are normal and do not warrant replacement of display.		
15.	To troubleshoot this issue completely, a known-good display clamshell is required.	Yes	Go to step 16.		
	Do you have immediate access to a known-good display clamshell?	No	Replace display clamshell. Verify issue resolved.	L02	LCD
16.	Substitute a known-good display clamshell to test logic board video output.	Yes	Replace display clamshell. Verify issue resolved.	L02	LCD
	Is normal video restored?	No	Replace logic board. Reinstall user’s display clamshell. Verify issue resolved.	M04	MLB
17.	Inspect display closely and determine if pixel “defects” are actually dust or debris on surface of glass panel.	Yes	Clean glass panel. Verify issue resolved.		
	Are “defects” caused by dust, debris, or other surface contamination?	No	Go to step 18.		
18.	Refer to Apple Support article <a href="#">HT1721: About LCD display pixel anomalies for Apple products released before 2010</a> or <a href="#">HT4044: About LCD display pixel anomalies for Apple products released in 2010 and later</a> (according to user’s computer model) to determine if the number of defects exceeds specification. Determine if the number of bright or dark pixel defects (or a combination of these) exceed specification.	Yes	Replace display clamshell. Verify issue resolved.	L20	LCD
	Does the number of pixel anomalies exceed specified limit?	No	Explain to user that display is within specifications. Do not replace display clamshell. Verify resolution.		
19.	Connect an external compatible display.	Yes	Go to step 20.		
	Are vertical and/or horizontal lines present on external display?	No	Go to step 24.		
20.	Vertical and/or horizontal lines may be related to a failing memory module. Watch closely during startup sequence for the exact point at which issue starts to occur.	After	Go to step 21.		
	Does issue occur AFTER Apple logo and spinning gear appears or BEFORE?	Before	Go to step 24.		
21.	To start up into Safe Mode, press power button. The Shift key should be held as soon as possible after the startup sound. Release Shift key when you see the gray Apple icon and spinning gear.	Yes	Go to step 24.		
	Does issue still occur in Safe Mode?	No	Go to step 22.		

	Check	Result	Action	Code	Commodity
22.	<p>Start up with just one memory module installed then start up again with just the other memory module. Retest with known-good memory.</p> <p><b>Note:</b> Always be sure to have at least the minimum amount of memory necessary to support the computer and its version of OS X. This may mean replacing a memory module with a known-good one of larger capacity for testing. For example, you may need to replace the 1 GB module with known-good 2 GB module to support starting into OS X 10.7 Lion.</p> <p>Does issue occur only with specific memory module(s)?</p>	Yes	<p>Replace memory module(s).</p> <p><b>Note:</b> Only replace defective memory module(s). There is no need to replace memory in pairs. Verify issue resolved.</p>	X99	MEMORY
		No	Go to step 23.		
23.	<p>Test a known-good memory module in one memory slot. Then test the known-good memory module in the other memory slot.</p> <p>Does issue occur only with a specific memory slot on logic board?</p>	Yes	Replace logic board. Reinstall user's memory. Verify issue resolved.	M07	MLB
		No	Go to step 24.		
24.	<p>Remove bottom case and inspect LVDS cable routing for misrouting. Disconnect LVDS cable from logic board. Inspect cable for pinching and cable connector for damaged or bent pins.</p> <p>Is LVDS cable or its connector damaged?</p>	Yes	Replace display clamshell. Verify issue resolved.	L14	LCD
		No	Go to step 25.		
25.	<p>Keep LVDS cable disconnected from logic board. Inspect LVDS connector port on logic board for damaged or bent pins.</p> <p>Is logic board LVDS connector port damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 26.		
26.	<p>To troubleshoot this issue completely, a known-good display clamshell is required.</p> <p>Do you have immediate access to a known-good display clamshell?</p>	Yes	Go to step 27.		
		No	Go to step 28.		
27.	<p>Substitute a known-good display clamshell to test logic board video output.</p> <p>Is normal video restored?</p>	Yes	Go to step 28.		
		No	Replace logic board. Reinstall user's display clamshell. Verify issue resolved.	M04	MLB
28.	<p>Examine image on the display closely and determine whether the lines are vertical or horizontal.</p> <p>Are the lines vertical or horizontal?</p>	Vertical	Replace display clamshell. Verify issue resolved.	L27	LCD
		Horizontal	Replace display clamshell. Verify issue resolved.	L26	LCD
29.	<p>Connect an external compatible display.</p> <p>Does image on external display appear distorted and/or blurred?</p>	Yes	Go to step 30.		
		No	Go to step 34.		



	Check	Result	Action	Code	Commodity
30.	A distorted or blurred image may be related to a failing memory module. Watch closely during startup sequence for the exact point at which issue starts to occur.  Does issue occur before or after Apple logo and spinning gear appear?	Before	Go to step 34.		
		After	Go to step 31.		
31.	To start up into Safe Mode, press power button. The Shift key should be held as soon as possible after the startup sound. Release Shift key when you see the gray Apple icon and spinning gear.  Does issue still occur in Safe Mode?	Yes	Go to step 34.		
		No	Go to step 32.		
32.	Start up with just one memory module installed then start up again with just the other memory module. Retest with known-good memory.  <b>Note:</b> Be sure to always have at least the minimum amount of memory installed to support the computer and its OS. This may mean replacing a memory module with a known-good one of larger capacity for testing. For example, you may need to replace the 1 GB module with known-good 2 GB module to support starting into OS X 10.7 Lion.  Does issue occur only with specific memory module(s)?	Yes	Replace memory module(s).  <b>Note:</b> Only replace defective memory module(s). There is no need to replace memory in pairs. Verify issue resolved.	X99	MEMORY
		No	Go to step 33.		
33.	Test a known-good memory module in one memory slot. Then test the known-good memory module in the other memory slot.  Does issue occur only with a specific memory slot on logic board?	Yes	Replace logic board. Reinstall user's memory. Verify issue resolved.	M07	MLB
		No	Go to step 34.		
34.	Remove bottom case and inspect LVDS cable routing for misrouting. Disconnect LVDS cable from logic board. Inspect cable for pinching and cable connector for damaged or bent pins.  Is LVDS cable or its connector damaged?	Yes	Replace display clamshell. Verify issue resolved.	L14	LCD
		No	Go to step 35.		
35.	Keep LVDS cable disconnected from logic board. Inspect LVDS connector port on logic board for damaged or bent pins.  Is logic board LVDS connector port damaged?	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 36.		
36.	To completely troubleshoot this issue, a known-good display clamshell is required.  Do you have immediate access to a known-good display clamshell?	Yes	Go to step 37.		
		No	Replace display clamshell. Verify issue resolved.	L04	LCD

	Check	Result	Action	Code	Commodity
37.	Substitute a known-good display clamshell to test logic board video output.	Yes	Replace display clamshell. Verify issue resolved.	L04	LCD
	Is normal video restored?	No	Replace logic board. Reinstall user's display clamshell. Verify issue resolved.	M04	MLB
38.	Verify display issue or anomaly has been resolved.  Is issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX Toolbar. Select Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Unstable Flickering

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, fan, hard drive, heat sink, MagSafe board, optical drive, power adapter, top case, trackpad

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Image flicker</li><li>Video “noise”</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model. Incorrect video graphic drivers will not work properly.</li><li>Check for and apply latest software and firmware updates.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>Reset SMC using procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>Start up from known-good original system media or an up-to-date, bootable OS X volume.</li><li>Verify F1 and F2 brightness keys are not stuck, triggering display brightness changes.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Use F1 and F2 keys to check if flickering varies with a change in backlight brightness levels.	Yes	Go to step 4.		
	Does flickering vary with backlight brightness?	No	Go to step 2.		
2.	Move display clamshell back and forth several times through its full range.	Yes	Go to step 4.		
	Does flickering occur with related clamshell movement?	No	Go to step 3.		
3.	Run Mac Resource Inspector (MRI) or check System Information (System Profiler in Snow Leopard) > Graphics/Displays to see if Color LCD is listed.	Yes	Go to step 4.		
	Is LCD detected in MRI or System Information?	No	Issue appears video-related. Go to "Power But Blank No Video" troubleshooting flow.		
4.	Display backlight may not be responding correctly to ambient light changes. Reset SMC using procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a> . While resetting SMC, observe MagSafe LED. It should quickly go off and then back to an idle or charging state.	Yes	Issue resolved with SMC reset. Verify resolution.		
	Did SMC reset resolve flickering issue?	No	Go to step 5.		

	Check	Result	Action	Code	Commodity
5.	Remove EMI gasket from LVDS cable. EMI gasket may be grounding the backlight or display signals, causing display flickering.	Yes	Replace EMI gasket. Verify issue resolved.	L06	
	Did EMI gasket removal resolve flickering issue?	No	Go to step 6.		
6.	Inspect and reseal LVDS cable connection between display clamshell and logic board. Reinstall EMI gasket, being careful to align it properly so that it doesn't short out the connector pins or adjacent connector components.	Yes	Issue resolved by cable reseal.		
	Did resealing cable connections resolve flickering issue?	No	Go to step 7.		
7.	Examine display closely to determine if backlight is the sole cause of flickering.	Yes	Go to "Backlight Issue/No Backlight" troubleshooting flow.		
	Is issue backlight-related only?	No	Go to step 8.		
8.	To troubleshoot this issue completely, a pair of known-good memory modules is required. In integrated graphics mode, the computer shares its memory with display graphics. Substituting known-good memory will determine if flickering is related to memory.	Yes	Go to step 13.		
	Do you have immediate access to two known-good memory modules?	No	Go to step 9.		
9.	Remove existing memory from top slot. Leave memory in bottom slot installed. Retest.	Yes	Go to step 10.		
	Does flickering persist with memory installed in bottom slot only?	No	Replace memory from top slot. Verify issue resolved.	M04	
10.	Remove memory from bottom slot and set it aside. Reinstall memory from top slot back into top slot. Retest.	Yes	Go to step 11.		
	Does flickering persist with memory installed in top slot only?	No	Replace memory from bottom slot. Verify issue resolved.	M04	
11.	To troubleshoot this issue completely, a known-good display clamshell is required.	Yes	Go to step 12.		
	Do you have immediate access to a known-good display clamshell?	No	Replace display assembly. Verify issue resolved.	L04	LCD
12.	Substitute a known-good display clamshell to test LVDS output from logic board.	Yes	Replace display assembly. Verify issue resolved.	L04	LCD
	Did a known-good display resolve flickering issue?	No	Replace logic board. Reinstall user's display clamshell. Verify issue resolved.	M04	MLB
13.	Substitute both known-good memory modules and retest.	Yes	Go to step 11.		
	Does flickering persist with known-good memory modules?	No	Go to step 14.		

	Check	Result	Action	Code	Commodity
14.	Remove known-good memory from top slot, leaving other known-good memory module in bottom slot. Reinstall one of user's memory modules in top slot. Retest.  Does flickering recur with one of user's memory modules installed?	Yes	Go to step 15.		
		No	Go to step 16.		
15.	Swap out user's memory in top slot with user's other memory module, continuing to leave known-good memory in bottom slot. Retest.  Does flickering recur with user's other memory module?	Yes	 <b>ESCALATION REQUIRED.</b>  Contact TSPS to replace both user's memory modules.	L06	
		No	Replace defective memory. Verify issue resolved.	M04	
16.	Swap out user's memory in top slot with user's other memory module, continuing to leave known-good memory in bottom slot. Retest.  Does flickering recur with user's other memory module?	Yes	Replace defective memory. Verify issue resolved.	M04	
		No	Go to step 17.		
17.	Move memory from top slot to bottom slot, and install known-good memory into top slot. Retest.  Does flickering recur with user's memory in bottom slot?	Yes	Replace defective memory. Verify issue resolved.	M04	
		No	Go to step 18.		
18.	Leaving known-good memory installed in top slot, remove user's memory from bottom slot and label it good. Install user's other memory module in bottom slot. Retest.  Does flickering recur with user's other memory module in bottom slot?	Yes	Replace defective memory. Verify issue resolved.	M04	
		No	Go to step 19.		
19.	Remove known-good memory from top slot, and install user's remaining memory module, leaving user's other memory module in bottom slot. Retest.  Does flickering recur with both user's memory modules installed?	Yes	 <b>ESCALATION REQUIRED.</b>  Contact TSPS to consider replacing both memory modules, since each module works while paired with known-good memory, but not when paired with each other.	M99	
		No	Issue resolved. Verify resolution.		

	Check	Result	Action	Code	Commodity
20.	Restart system and confirm display no longer flickers.  Is issue resolved?	Yes	Issue resolved with multiple memory reseats. Verify resolution.		
		No	  <b>ESCALATION REQUIRED.</b>  Contact TSPS for additional support or a multiple-part repair. Click Help button in GSX toolbar > Technical Help with a Repair > Contact Apple.	L99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Thunderbolt Target Display Mode Issues

## Unlikely causes:


AirPort/Bluetooth card, battery, bottom case, display clamshell, fan, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, solid-state drive (SSD), top case, trackpad

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Computer does not initiate Thunderbolt target display mode connection.</li><li>Thunderbolt-capable iMac does not switch to display mode when you press Command(⌘)+F2 on iMac keyboard (to activate target display mode).</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check that computer intended to be used as target display supports target display mode via Thunderbolt, and that a Thunderbolt cable is used. Refer to Apple Support article <a href="#">TS3775: Target Display Mode does not work with Mini DisplayPort cable</a>.</li><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for these computer models. Correct build contains Thunderbolt drivers that match logic board Thunderbolt controller.</li><li>Check for and apply latest software and firmware updates on both computers.</li><li>Check System Information (System Profiler in Snow Leopard) &gt; Hardware &gt; Thunderbolt to verify that Thunderbolt hardware is recognized.</li><li>Try a known-good Thunderbolt to Thunderbolt cable (2 m).</li><li>Review <a href="#">HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ)</a> to verify that computer has latest Thunderbolt firmware versions installed.</li><li>See Apple Support article <a href="#">HT4614: About Thunderbolt to Thunderbolt cable (2 m)</a>.</li><li>Verify computer using a known good Apple Thunderbolt cable (2m).</li><li>An aluminum frame Apple wired or wireless keyboard is required to activate Thunderbolt Target Display Mode on your target Mac.</li></ol> <p>Earlier Apple wired and wireless keyboards as well as keyboards from other manufacturers will not activate Thunderbolt Target Display mode when pressing Command-F2.</p> <p>Ensure that you are using a known-good, compatible, aluminum frame Apple keyboard with your target Mac.</p>


## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model. Correct build contains Thunderbolt drivers that match logic board Thunderbolt controller.	Yes	Go to step 2.		
		No	Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to reinstall correct system build (with Thunderbolt drivers) for this computer model. Use Software Update to make sure newest versions are installed. Verify issue resolved.		
	Is proper OS version installed?				

	Check	Result	Action	Code	Commodity
2.	Check for and apply latest software and firmware updates. Check System Information > Hardware > Thunderbolt. If no device is connected, Thunderbolt controller should be listed as the type of computer (for example, MacBook Pro) with a unique user ID (UID) and firmware version shown.	Yes	Go to step 4.		
		No	Go to step 3.		
	Does System Information list Thunderbolt hardware?				
3.	Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.	Yes	Go to step 4.		
		No	Go to “Thunderbolt Not Recognized” troubleshooting flow.		
	Does System Information list Thunderbolt hardware?				
4.	Inspect Thunderbolt port on user's computer for physical damage, a burnt connector or misalignment.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 5.		
	Does Thunderbolt port show any damage?				
5.	<p>To troubleshoot this issue completely, the following known-good parts are required:</p> <ul style="list-style-type: none"> <li>Thunderbolt-capable Mac</li> <li>Thunderbolt to Thunderbolt cable (2 m)</li> </ul> <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 6.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Request TSPS help checking latest updates and System Information &gt; Hardware &gt; Thunderbolt.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
6.	Connect a known-good Thunderbolt to Thunderbolt cable (2 m) between user's computer and a known-good Thunderbolt-capable iMac. Start up both computers to desktop, then press Command-F2 on known-good iMac to activate target display mode for user's computer.	Yes	Go to step 9.		
		No	Go to step 7.		
	Does known-good iMac become a target display for user's computer?				



	Check	Result	Action	Code	Commodity
7.	<p>Check System Information &gt; Hardware &gt; Thunderbolt on user's computer to verify Thunderbolt port connection and port status. Connection to known-good iMac should show as "Macintosh".</p> <p>Hardware &gt; Graphics &gt; Displays should show any displays recognized by user's computer and list Color LCD and iMac display information.</p> <p>Does System Information list target display mode information?</p>	Yes	Go to step 8.		
		No	Replace logic board. Verify issue resolved.	M32	MLB
8.	<p>Substitute a known-good Thunderbolt to Thunderbolt cable (2 m) between user's computer and known-good iMac. Start up both computers to desktop, then press Command-F2 on known-good iMac to activate target display mode for user's computer. Check System Information &gt; Hardware &gt; Graphics &gt; Displays on user's computer to see if Color LCD and iMac displays are present and activated.</p> <p>Does System Information list target display mode information?</p>	Yes	Go to step 9.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Inform TSPS that user's computer cannot activate TDM to a known-good Thunderbolt iMac computer while it does show a connection to Thunderbolt device tree.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
9.	<p>Inspect user's Thunderbolt to Thunderbolt (2 m) cable for physical damage, such as contamination or burnt connectors on either end of cable.</p> <p>Is user's Thunderbolt cable damaged?</p>	Yes	Replace Thunderbolt to Thunderbolt (2m) cable. Verify issue resolved.	X26	EXTERNAL CABLE
		No	Go to step 10.		
10.	<p>Connect user's Thunderbolt to Thunderbolt (2 m) cable between user's computer and a known-good Thunderbolt-capable iMac. Start up both computers to desktop, then press Command-F2 on known-good iMac to activate target display mode for user's computer.</p> <p>Does known-good iMac become a target display for user's computer?</p>	Yes	Issue resolved. Verify resolution.		
		No	Replace Thunderbolt to Thunderbolt (2m) cable. Verify issue resolved.	X03	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
11.	<p>Check System Information to confirm that Thunderbolt hardware is recognized and has a unique UID, current firmware revisions and link status.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Apple Remote Issues

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fans, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, speakers, top case, trackpad

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Apple Remote is not recognized.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Verify computer is on, awake, and that infrared (IR) window is clean.</li><li>Verify remote has functioning batteries. Open Photo Booth or iChat's Video Preview window. Point remote at built-in iSight camera. Press any button on remote and verify that (as seen through the camera) there is a faint blinking light emitted from the remote. If no light is emitted, test remote with known-good batteries.</li><li>In System Preferences &gt; Security &amp; Privacy (Security in Snow Leopard) &gt; General, verify that "Disable remote control infrared receiver" is not checked. If "Unpair" button is active, press it and try to pair again with Apple Remote. See Apple Support article <a href="#">HT1619: Pairing your Apple Remote with your computer</a>.</li><li>Facing a known-good computer, simultaneously press both Menu and Next buttons on the remote for five seconds to try to pair it.</li><li>Repeat previous step with a known-good remote, facing user's computer. (Remote should be used within 30 feet of computer, with an unobstructed line of sight to IR window.)</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>Reset SMC using procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Retest remote to see if it is completely inoperative, even after attempting all Quick Checks.	Yes	Go to step 2.		
		No	Replace Apple Remote. Verify issue resolved.	X04	WIRELESS DEVICE
2.	Does user's remote function at all?	Yes	Go to step 3.		
		No	Replace Apple Remote. Verify issue resolved.	X04	WIRELESS DEVICE
3.	Verify all buttons on remote function properly.	Yes	Go to step 3.		
		No	Replace Apple Remote. Verify issue resolved.	X04	WIRELESS DEVICE
3.	Does each button on user's remote work correctly?	Yes	Go to step 4.		
		No	Replace Apple Remote. Verify issue resolved.	X05	WIRELESS DEVICE
3.	Check if battery life in user's remote is too short.	Yes	Go to step 4.		
		No	Replace Apple Remote. Verify issue resolved.	X05	WIRELESS DEVICE
3.	Is battery life in user's remote within specification?	Yes	Go to step 4.		
		No	Replace Apple Remote. Verify issue resolved.	X05	WIRELESS DEVICE

	Check	Result	Action	Code	Commodity
4.	<p>Reseat flex cable connection from IR sensor* to logic board. Retest with a known-good Apple Remote.</p> <p>*Part name of IR sensor cable will vary with computer model (for example, “Hard Drive/IR/Sleep Indicator cable” or “HD Front Bracket/Flex Cable with IR and Sleep LED.”) Check Service Guide for model-specific part name.</p> <p>Does a known-good Apple remote work?</p>	Yes	Issue resolved by reseating cable connection. Verify issue resolved.		
		No	Go to step 5.		
5.	<p>To troubleshoot this issue completely, a known-good IR sensor cable* is required.</p> <p>*Part name of IR sensor cable will vary with computer model (for example, “Hard Drive/IR/Sleep Indicator cable” or “HD Front Bracket/Flex Cable with IR and Sleep LED.”) Check Service Guide for model-specific part name.</p> <p>Do you have immediate access to a known-good IR cable?</p>	Yes	Go to step 6.		
		No	Replace IR cable. Verify issue resolved.	X03	
6.	<p>Substitute a known-good IR cable and retest with a known-good Apple Remote.</p> <p>Does known-good remote work?</p>	Yes	Replace IR cable. Verify issue resolved.	X03	
		No	Replace logic board. Reinstall user's IR cable. Verify issue resolved.	M15	MLB
7.	<p>Verify that a known-good Apple Remote communicates with user's computer successfully over multiple trials.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Audio Headphone Jack Issues

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan(s), hard drive/solid-state drive, heat sink, MagSafe board, memory, optical drive, power adapter, top case, trackpad

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Plug cannot be inserted into headphone jack.</li><li>• Audio through headphone/external speakers missing one channel, produces crackly sound or drops out intermittently.</li><li>• Headphones missing one channel,</li><li>• Volume Up/Down and Select buttons of remote do not work when an Apple Earphones with Remote and Mic is connected,</li><li>• No sound from internal speakers, just internal red light in headphone jack when playing audio.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>1. Press F12 key to increase volume to maximum and verify audio is not muted.</li><li>2. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model. Update or restore if needed.</li><li>3. Check for and apply latest software and firmware updates.</li><li>4. Go to System Preferences &gt; Sound and verify the following. Output tab:<ul style="list-style-type: none"><li>◦ Device for sound output is set to Internal Speakers and Balance is set to center of slider.</li><li>◦ Output volume is not muted or set to zero.</li></ul>Input tab:<ul style="list-style-type: none"><li>◦ Line In input source is available and selected when an analog audio source is connected</li><li>◦ Input volume slider is not set to zero (available only with an analog audio input).</li></ul></li><li>5. Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>6. Start up from known-good original system media or an up-to-date, bootable OS X volume.</li></ol>

## Deep Dive


	Check	Result	Action	Code	Commodity
1.	Use an otoscope to closely inspect inside of headphone jack for any foreign objects or bent pins. If necessary, use compressed air to remove any dust or debris.	Yes	Go to step 2.		
	Are there any internal obstructions that would prevent insertion of a 1/8" (3.5mm) mini-plug?	No	Go to step 4.		
2.	Attempt to remove obstruction if possible to do without causing connector or cosmetic damage. Do not attempt to straighten bent pins.	Yes	Replace logic board. Verify issue resolved.	M09	MLB
	Are there bent pins or a stuck obstruction?	No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	Once all obstructions are removed, retest headphone jack, playing a reliable audio source and known-good headphones. Play same audio through internal speakers, comparing playback quality between speakers and headphones. It should be clear and undistorted through both left and right channels.  Are headphone jack and internal speaker operation restored?	Yes	Issue resolved by removing obstruction. Verify issue resolved.		
		No	Replace logic board. Verify issue resolved.	M09	MLB
4.	To fix a misaligned headphone jack, loosen logic board screws enough to align connector and logic board. Retest headphone jack using a reliable audio source and known-good headphones. Play same audio through internal speakers, comparing playback quality between speakers and headphones. It should be clear and undistorted through both left and right channels.  Is connector damaged or is logic board unable to be aligned?	Yes	Replace logic board. Verify issue resolved.	M09	MLB
		No	Go to step 5.		
5.	Even with plug fully seated, a worn or contaminated connector can cause audio to crackle, play back through only left or right channel, or intermittently drop out—while internal speakers produce clear, undistorted stereo sound.  Test with known-good Apple Earphones with Remote and Mic. Set System Preferences > Sound > Output tab to Headphones. Set Input tab to External microphone when testing connections. Please refer to <a href="#">HT3554: How to use Apple Earphones with Remote and Mic with your Mac</a> for more information.  Do symptoms include audio dropouts, crackly sound, missing channel, or total loss of mic or remote?	Yes	Replace logic board. Verify issue resolved.	M09	MLB
		No	Go to step 6.		
6.	If switch deep inside headphone jack does not reset properly, it may cause jack to falsely detect a digital optical cable, disabling internal speakers. To check for this symptom, check System Preferences > Sound to see if digital optical cable is listed when nothing is plugged into headphone jack. You may also see a red LED flashing inside headphone jack during audio playback.  Does System Preferences > Sound list digital optical cable with nothing plugged into headphone jack?	Yes	Go to step 7.		
		No	Go to step 11.		
7.	Specify which Mac notebook is exhibiting headphone jack issue: a Mid 2012 model or an earlier model?	Mid 2012	Go to “No Audio from Internal Speaker(s)” troubleshooting flow.		
	Is computer a Mid 2012 model or an earlier model?	Earlier Model	Go to step 8.		


	Check	Result	Action	Code	Commodity
8.	Specify which Mac notebook is exhibiting headphone jack issue: 13-inch or 15/17-inch?	15-inch or 17-inch Model	Go to “No Audio from Internal Speaker(s)” troubleshooting flow.		
	Is computer a 13-inch or a 15-inch/17-inch notebook?	13-inch Model	Go to step 9.		
9.	Specify which Mac notebook is exhibiting headphone jack issue: MacBook 13-inch or MacBook Pro-13 inch?	MacBook	Go to “No Audio from Internal Speaker(s)” troubleshooting flow.		
	Is computer a MacBook or a MacBook Pro?	MacBook Pro	Go to step 10.		
10.	Specify which MacBook Pro model: <ul style="list-style-type: none"> <li>MacBook Pro (13-inch, Mid 2009 and Mid 2010)</li> <li>MacBook Pro (13-inch, Early 2011 and Late 2011)</li> </ul>	Early 2011 / Late 2011	Go to “No Audio from Internal Speaker(s)” troubleshooting flow.		
	Is computer MacBook Pro (13-inch, Mid 2009/Mid 2010) or MacBook Pro (13-inch, Early 2011/Late 2011)?	Mid 2009 / Mid 2010	Go to “No Audio from Internal Speaker(s)” troubleshooting flow.		
11.	From customer information, identify which function of audio out (headphone) port is affected. Determine if issue occurs while using analog (headphones or external speakers) or digital (optical cable connected to a digital amplifier or to another computer with digital input) functionality.	Analog	Go to step 12.		
		Digital (Optical)	Go to step 16.		
	Which audio output is affected: analog or digital?				

	Check	Result	Action	Code	Commodity
12.	<p>Audio out jack supports remote commands and audio input when connected to Apple Earphones with Remote and Mic. Disconnect any connected headphones or speakers. In System Preferences &gt; Sound &gt; Input tab, select Internal microphone, and adjust Input volume slider. Connect known-good Apple Earphones with Remote and Mic.</p>  <p>Verify the following:</p> <ul style="list-style-type: none"> <li>• Input source name changes to External microphone when headset is connected.</li> <li>• Input volume preset changes accordingly.</li> <li>• Signal registers on Input level indicator when you talk near headset microphone. (Adjust Input volume slider if necessary.)</li> <li>• Run iTunes and verify that computer volume Up/Down and iTunes track Play/Pause can be controlled by pressing Up/Down/Central buttons of Apple Earphones with Remote and Mic.</li> </ul> <p>Does computer exhibit any issue with Apple Earphones with Remote and Mic detection or audio input?</p>	Yes	Replace logic board. Verify issue resolved.	M09	MLB
		No	Go to step 13.		
13.	<p>Check on left side of computer for audio ports. Depending on computer configuration, there may be only one external audio port (used for output or audio input), or there may be two external audio ports (one audio output and one audio input).</p> <p>Does computer have only one audio port or two audio ports?</p>	One Audio Port	Go to step 14.		
		Two Audio Ports	Computer analog audio output appears to be performing to specifications. Verify issue resolved.		



	Check	Result	Action	Code	Commodity
14.	<p>13-inch MacBook Pros only have one audio port. If configured, this headphone jack also supports line in analog audio input.</p> <p>Disconnect any connected headphones or speakers. Open System Preferences &gt; Sound &gt; Input tab, select Internal microphone and adjust Input volume slider. Locate popup menu <b>Use audio port for:</b> and select Sound Input. Connect a 1/8" (3.5mm) male-to-male stereo mini-plug cable to this port and to an analog audio source (like iPod, iPhone, iPad, or another computer's audio out port). Play audio, and verify the following:</p> <ul style="list-style-type: none"> <li>• Input source name changes to Line In when cable is connected.</li> <li>• Input volume preset changes accordingly.</li> <li>• Signal registers on Input level indicator when playing audio. (Adjust Input volume slider and volume on audio source if necessary),</li> <li>• Input source name changes back to Internal microphone when cable is disconnected,</li> <li>• <b>Use audio port for:</b> popup menu can be set back to Sound Output, to configure audio port to output audio.</li> </ul> <p>Does computer exhibit any issue with analog line in?</p>	Yes	Go to step 15.		
		No	Computer analog audio output appears to perform to specifications. Verify issue resolved.		
15.	<p>Start up computer using known-good original system media or an up-to-date, bootable OS X volume, and try to reproduce audio input issue using known-good audio sources and cables.</p> <p>Does issue persist with a known-good OS?</p>	Yes	Replace logic board. Verify issue resolved.	M09	MLB
		No	Restore OS with correct Mac OS X build: See Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> . Verify issue resolved.		
16.	<p>A 1/8" (3.5mm) Mini-TOSLINK® male-to-male optical cable can carry digital audio output to digital audio line in. To aid in troubleshooting this issue, a known-good 1/8" Mini-TOSLINK® optical cable is required.</p> <p>Do you have immediate access to a known-good 1/8" Mini-TOSLINK® cable?</p>	Yes	Go to step 17.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Computer digital output cannot be tested without adequate 1/8" (3.5mm) Mini-TOSLINK® male-to-male optical cable. See Apple Support article <a href="#">PH3676: Audio ports</a> for further information.</p>	M99	

	Check	Result	Action	Code	Commodity
17.	Connect 1/8" (3.5mm) Mini-TOSLINK® cable to audio out (headphone) port.	Yes	Go to step 18.		
	<p>In System Preferences &gt; Sound &gt; Output tab, verify that a digital out source appears and select it.</p> <p>Play a known-good audio file or internet radio station.</p> <p>Audio output should switch to optical digital audio, and unplugged end of cable should emit a red light to indicate transmission of a digital audio stream.</p> <p>Is red light (fiber optic audio signal) visible at unplugged end of Mini-TOSLINK® cable?</p>	No	Replace logic board. Verify issue resolved.	M09	MLB
18.	Continue to play known-good audio.	Yes	Go to step 19.		
	<p>On another known-good computer (with optical digital in input):</p> <ul style="list-style-type: none"> <li>• Connect other end of 1/8" (3.5mm) Mini-TOSLINK® cable to audio in (mic) port.</li> <li>• Launch QuickTime Player and select New Audio Recording from File menu.</li> <li>• In new recording window, select Built-in Input: Digital In from input source popup menu. Adjust volume using slider in center of window.</li> </ul> <p>Does bar graph at bottom of recording window show input activity?</p>	No	Replace logic board. Verify issue resolved.	M09	MLB
19.	On known-good computer:	Yes	Computer digital audio output appears to be performing to specifications. Verify issue resolved.		
	<ul style="list-style-type: none"> <li>• Press record button to start recording.</li> <li>• Let system record for several seconds.</li> <li>• Stop recording.</li> <li>• Play recorded audio file.</li> </ul> <p>Does known-good computer accurately reproduce sound recorded from external audio output?</p>	No	Replace logic board. Verify issue resolved.	M09	MLB

	Check	Result	Action	Code	Commodity
20.	<p>Test audio output performance to verify a successful repair.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Built-in Keyboard Does Not Work Properly

## Unlikely causes:



AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fans, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, speakers, trackpad

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Sticky key(s)</li><li>Keycap(s) or key switch mechanism(s) broken</li><li>Keystrokes not recognized</li><li>Keyboard locks up</li><li>Displayed characters don't match keys pressed</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Press Caps Lock key to see if LED lights up, indicating at least a partial connection to logic board.</li><li>Confirm correct keyboard layout is selected in System Preferences &gt; Language &amp; Text &gt; Input Sources.</li><li>Enable Keyboard &amp; Character Viewer In System Preferences &gt; Language &amp; Text &gt; Input Sources. From the Input menu in the menu bar, select "Show Keyboard Viewer". Test whether keystrokes on keyboard are recognized in Keyboard Viewer. If internal keyboard is not functioning, use an external USB keyboard to perform this step.</li><li>If a key responds abnormally to finger pressure, remove keycap and inspect underneath for foreign material. See Apple Support article <a href="#">OP121: MacBook and MacBook Pro: Black keycap replacement</a>.</li><li>If a keycap is loose, make sure the clasp is intact. If not, reattach it.</li><li>Check for and apply latest software and firmware updates.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check keyboard and keycaps for damage. If you discover accidental damage, follow guidelines listed in Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a> .  Are there any damaged keycaps?	Yes	<ul style="list-style-type: none"><li>If a keycap kit is available for this model, replace affected key(s). See Apple Support article <a href="#">OP121: MacBook and MacBook Pro: Black keycap replacement</a>.</li><li>If no keycap kit is available, replace top case. Verify issue resolved.</li></ul>	K27	KEYBOARD
		No	Go to step 2.		
2.	Start up from known-good original system media or an up-to-date, bootable OS X volume. Attempt to reproduce the keyboard issue.  Does issue persist with known-good OS?	Yes	Go to step 3		
		No	Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> and install correct version of OS X. Apply latest software and firmware updates. Verify issue resolved.		

	Check	Result	Action	Code	Commodity
3.	Disconnect keyboard flex cable and check for damage (de-lamination, torn cable end, missing or cracked tracks). Reseat keyboard flex cable using a short piece of Kapton tape to leverage cable into connector. Make sure 1) cable end is fully inserted and aligned with connector on logic board and 2) connector lock is fully closed.  	Yes	Issue resolved by reseating keyboard flex cable. Verify resolution.		
		No	Go to step 4.		
4.	Are all keys functional?  To troubleshoot this issue completely, a known-good top case is required.  Do you have immediate access to a known-good top case?	Yes	Go to step 5.		
		No	Replace top case. Verify issue resolved.	K01	KEYBOARD
5.	Substitute a known-good top case and retest.  Are all keys functional?	Yes	Replace top case. Verify issue resolved.	K01	KEYBOARD
		No	Replace logic board. Reinstall user's top case. Verify issue resolved.	M16	MLB
6.	<ul style="list-style-type: none"> <li>• Verify that all keys are functional after repair, including modifier keys.</li> <li>• Check keyboard backlight function, if applicable.</li> <li>• Run ASD OS X User Interactive Tests.</li> </ul> Is issue resolved?	Yes	Issue resolved.		
		No	  <b>ESCALATION REQUIRED.</b>  Contact TSPS for additional support or a multiple-part repair.  Click the Help button in the GSX toolbar > Technical Help with a Repair > Contact Apple.	K99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Built-in Keyboard Has Dim or No Keyboard Backlight

## Unlikely causes:


AirPort/Bluetooth card(s), battery, bottom case, fan, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, trackpad

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>In a darkened room, keyboard backlight is dim or doesn't illuminate.</li><li>Uneven keyboard illumination: some keys are dim or a single key is significantly brighter than others.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Check System Preferences &gt; Keyboard to see if the "Automatically illuminate keyboard in low light" / "Illuminate keyboard in low light conditions" option is available and checked. If you do not see the "Automatically illuminate keyboard in low light" option, the computer does not feature a backlit keyboard. Refer to Apple Support article <a href="#">HT4882: Portables: Adjusting the keyboard backlight</a>.</li><li>Keyboard backlight is enabled only when the ambient light sensor (ALS) detects low light conditions. Check System Preferences &gt; Displays to see if the "Automatically adjust brightness" / "Automatically adjust brightness as ambient light changes" option is checked.</li><li>Check ALS functionality by covering sensor (located on display clamshell near camera) with your hand to simulate a dark room. Verify that keyboard backlight brightness increases.</li><li>Keep ALS covered and press the F6 key to increase keyboard backlight level.</li><li>Reset SMC using the procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Reseat camera cable connection to logic board. Retest with Mac Resource Inspector (MRI) or System Information (System Profiler in Snow Leopard) to check for presence of camera, AirPort, Bluetooth, and ALS.	Yes	Go to step 2.		
	Did MRI or System Information detect all devices?	No	Go to "Camera Issues" troubleshooting flow.		
2.	Locate the keyboard backlight flex cable connector on the logic board and verify that the keyboard backlight flex cable is connected.	Yes	Go to step 4.		
	Is flex cable connected?	No	Go to step 3.		
3.	Remove logic board and locate the keyboard backlight flex cable underneath. Reassemble computer and retest.	Yes	Issue resolved by reseating the keyboard backlight flex cable. Verify resolution.		
	Is keyboard backlight functioning?	No	Go to step 4.		

	Check	Result	Action	Code	Commodity
4.	Check the keyboard backlight flex cable and connector for damage.	Yes	Keyboard backlight flex cable is part of top case. Replace top case. Verify issue resolved.	K16	KEYBOARD
	Is cable or connector damaged?	No	Go to step 5.		
5.	Check the keyboard backlight flex cable connector on the logic board for damage.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
	Is connector damaged?	No	Go to step 6.		
6.	Reseat the keyboard backlight flex cable on the logic board. Reassemble computer and retest.	Yes	Issue resolved by reseating the keyboard backlight flex cable. Verify resolution.		
	Is keyboard backlight functioning?	No	Go to step 7.		
7.	To troubleshoot this issue completely, a known-good top case is required.	Yes	Go to step 8.		
	Do you have immediate access to a known-good top case?	No	Replace top case. Verify issue resolved.	K10	KEYBOARD
8.	Substitute a known-good top case and retest.	Yes	Replace top case. Verify issue resolved.	K10	KEYBOARD
	Is keyboard backlight functioning?	No	Replace logic board. Reinstall user's top case. Verify issue resolved.	M25	MLB
9.	Run MRI to verify that the computer passes all tests. Run ASD OS User Interactive test and select the Photometer (ALSL) Light sensor test.  Check that the keyboard backlight activates evenly in low light conditions and can be adjusted using F5 and F6 keys.  Is the issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Built-in Keyboard or Trackpad Not Recognized

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, speakers

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>No key recognized except power button.</li><li>Caps Lock LED does not light up when pressed.</li><li>Neither keyboard nor trackpad recognized.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and quoting accidental damage for Mac portables</a>.</p>	<ol style="list-style-type: none"><li>Press Caps Lock key to see if LED lights up, indicating at least a partial connection to logic board.</li><li>Enable the Keyboard &amp; Character Viewer in System Preferences &gt; Language &amp; Text &gt; Input Sources. From the Input menu in the menu bar, select "Show Keyboard Viewer". Test whether keystrokes on keyboard are recognized in Keyboard Viewer. If internal keyboard is not functioning, use an external USB keyboard to initiate this step.</li><li>Verify that installed OS X version build is appropriate for this model. See Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a>.</li><li>If trackpad is also not working, check System Information (System Profiler in Snow Leopard) &gt; Hardware &gt; USB to see if "Apple Internal Keyboard / Trackpad" is recognized. Use an external USB mouse, if needed, to access System Information / System Profiler.</li><li>Reset SMC using the procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Restart computer and hold down Option (Alt) key during startup. After a few seconds, Startup Manager should appear.  Does computer boot to Startup Manager?	Yes	Go to step 2.		
		No	Go to step 4.		
2.	Test trackpad by attempting to move cursor while in Startup Manager.  Does trackpad function while in Startup Manager?	Yes	Go to step 3.		
		No	Go to step 4.		
3.	Start up computer with known-good original system media or an up-to-date, bootable OS X volume.  Do keyboard and trackpad both function with known-good OS?	Yes	Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> and update computer to the correct version and build of OS X. Verify resolution.		
		No	Go to step 4.		



	Check	Result	Action	Code	Commodity
4.	<p>Reseat keyboard flex cable. You may need to use a short piece of Kapton tape to help place the cable into the connector.</p> <p>Also reseat trackpad flex cable.</p>  <p>Do the keyboard and trackpad now function?</p>	Yes	Issue resolved by reseating cables. Verify resolution.		
		No	Go to step 5.		
5.	<p><b>Important:</b> Disconnect keyboard flex cable to logic board.</p> <p>On the logic board there are two power-on pads that can be shorted to power on a computer. Refer to Apple Support article <a href="#">TP695: Portables: Logic Board Power-On Pads</a> for exact location of each model's power-on pads.</p> <p><b>Note:</b> Be extra careful not to touch any other components to avoid damaging the logic board.</p> <p>Does trackpad now function?</p>	Yes	Replace top case. Verify issue resolved.	K03	KEYBOARD
		No	Go to step 6.		
6.	<p>Reconnect the keyboard flex cable and disconnect the trackpad flex cable from the logic board. Restart the computer and hold down the Option (Alt) key during startup. After a few seconds, Startup Manager should appear.</p> <p>Does the computer boot to Startup Manager?</p>	Yes	Replace trackpad. Verify issue resolved.	K23	OTHER ELECTRIC
		No	Replace logic board. Verify issue resolved.	M16	MLB
7.	<ul style="list-style-type: none"> <li>• Verify that both the keyboard and trackpad are now functioning properly.</li> <li>• Verify that all keys are functional after repair, including the modifier keys.</li> <li>• Check the keyboard backlight function, if present on this model.</li> <li>• Run ASD OS X User Interactive Tests.</li> </ul> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Built-in Trackpad Does Not Track Properly

## Unlikely causes:

AirPort/Bluetooth card(s), bottom case, display clamshell, fans, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, speakers, top case


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Cursor does not move with trackpad input.</li><li>• Trackpad select button is inoperable.</li><li>• Multi-Touch features are inoperable.</li><li>• Most keyboard keys do not respond, except power button and modifier keys.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and quoting accidental damage for Mac portables</a>.</p>	<ol style="list-style-type: none"><li>1. Check for environmental factors such as humidity, hand lotion, or jewelry. Check to see if user is touching the trackpad simultaneously with both hands.</li><li>2. With computer off, clean trackpad surface using a clean, dry, lint-free cloth.</li><li>3. In System Preferences &gt; Universal Access, disable all assisted “Keyboard” and “Mouse &amp; Trackpad” settings. Retest trackpad functionality.</li><li>4. Check for and apply latest software and firmware updates.</li><li>5. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>6. Start up from known-good original system media or an up-to-date, bootable OS X volume.</li><li>7. If issue occurs when computer is running from a power adapter, try using a three-prong power cable rather than a two-prong duckhead.</li><li>8. If issue persists with a three-prong power cable, refer to Apple Support article <a href="#">TS1248: Intel-based Apple Portables: Troubleshooting unresponsive trackpad issues</a> for further instructions.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Verify that trackpad button depresses normally. Check for proper trackpad alignment and verify that the click-depth set screw is at its factory setting.	Yes	Issue resolved. Verify resolution.		
	Are trackpad and keyboard functioning normally?	No	Go to step 2.		
2.	If trackpad button behaves as if it is being pressed continuously, a swollen battery may be preventing trackpad button from releasing. If so, remove battery to determine whether trackpad button functionality returns.	Yes	Go to “Battery Leaking or Swollen” troubleshooting flow.		
	Does trackpad button behave normally once battery is removed?	No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	Reseat trackpad flex cable connector securely into its connector port on logic board. Retest trackpad and keyboard functionality.	Yes	Issue resolved. Verify resolution.		
		No	Go to step 4.		
	Are trackpad and keyboard functioning normally?				
4.	Inspect trackpad flex cable and connector for damage (de-lamination, torn cable end, missing or cracked tracks).	Yes	Replace trackpad. Verify issue resolved.	K16	MOUSE
	Is trackpad flex cable damaged?	No	Go to step 5.		
5.	Inspect trackpad cable connector on logic board for damage.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
	Is logic board trackpad cable connector damaged?	No	Go to step 6.		
6.	To troubleshoot this issue completely, a known-good trackpad is required.	Yes	Go to step 7.		
	Do you have immediate access to a known-good trackpad?	No	Go to step 8.		
7.	Substitute a known-good trackpad and test trackpad functionality.	Yes	Go to step 8.		
	Are trackpad and keyboard functioning normally?	No	Replace logic board. Reinstall user's trackpad. Verify issue resolved.	M16	MLB
8.	Specify whether issue involves <b>tracking</b> on the trackpad surface or <b>clicking</b> the trackpad button.	Tracking	Go to step 9.		
	Is issue tracking or clicking?	Clicking	Replace trackpad. Verify issue resolved.	K13	MOUSE
9.	Specify which of the following symptoms describes the tracking issue:	No Response	Replace trackpad. Verify issue resolved.	K23	MOUSE
	<ul style="list-style-type: none"><li>Trackpad responds, but has a tracking issue.</li><li>Trackpad does not respond at all.</li></ul> Which symptom is the issue?	Tracking Issue	Replace trackpad. Verify issue resolved.	K12	MOUSE

	Check	Result	Action	Code	Commodity
10.	<p>Check trackpad and button functionality, including Multi-Touch and secondary click. Also check keyboard functionality.</p> <p>Using ASD OS User Interactive test, run the following tests:</p> <ul style="list-style-type: none"> <li>Trackpad: Multi-Touch edge trace test</li> <li>Trackpad: Left, right, center tests</li> </ul> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Distorted Audio from Internal Speaker(s)

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fans, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, top case, trackpad

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Audio is distorted, fuzzy, or crackly.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Test with known-good audio file.</li><li>Compare same audio and settings against a known-good computer to verify that audio is distorted.</li><li>In System Preferences &gt; Sound &gt; Output, adjust Output volume, and use Balance slider to isolate distortion source to left speaker or right speaker/subwoofer.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>If testing using iTunes, verify both equalizer and preamp settings are set to "Flat."</li><li>Test audio output using more than one application or website.</li><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Compare same audio using internal speakers and known-good headphones or external speakers.	Yes	Go to step 2.		
	Is audio distorted through both internal and external devices?	No	Go to step 3.		
2.	Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. In System Preferences > Sound > Output, adjust Output volume and retest with a known-good audio file and external speakers or headphones.	Yes	Issue resolved with PRAM reset. Verify resolution.		
	Is audio from both internal and external speakers now audible, clear, and free of distortion?	No	Got to step 16.		

	Check	Result	Action	Code	Commodity
3.	<p>In System Preferences &gt; Sound &gt; Output, move Balance slider all the way left then all the way right, testing audio output at both settings. Test full range of volume settings.</p> <p>The subwoofer transmits low-range tones through both left and right channels at once. Listen closely to higher range tones to determine if left and right speakers are achieving proper stereo playback and separation between channels.</p> <p>Is audio from all speakers audible, clear, and free of distortion?</p>	Yes	Issue resolved by adjusting levels. Verify resolution.		
		No	Go to step 4.		
4.	<p>Right speaker and subwoofer are on one assembly and have a logic board connection near fan. Inspect cable, cable connector, and logic board connector. Look for pinched or cut wires, bent or lost pins, or cracked connector housing.</p> <p>Are cable and both connectors from right/subwoofer speaker set to logic board free of damage?</p>	Yes	Go to step 6.		
		No	Go to step 5.		
5.	<p>Identify whether damage is located on right/subwoofer speaker set cable or connector, or on logic board connector. Look for cracked or damaged housing on connector or bent metal blade pins in connector port.</p> <p>Which cable/connector is damaged: right/subwoofer speaker set or logic board?</p>	Right/Subwoofer Speaker Set	Replace right/subwoofer speaker set assembly. Verify issue resolved.	X09	OTHER ELECTRIC
		Logic Board	Replace logic board. Verify issue resolved.	M24	MLB
6.	<p>The subwoofer also plays left channel audio. To distinguish between left speaker and left channel distortion, disconnect right/subwoofer speaker set from logic board and retest to verify left speaker is producing clear, undistorted audio.</p> <p>Is audio from left speaker free of distortion when right/subwoofer speaker set is disconnected?</p>	Yes	Go to step 12.		
		No	Go to step 7.		
7.	<p>Remove logic board and inspect speaker cable connection to logic board. Look for cracked or damaged connector housing or bent metal blade pins in connector port.</p> <p>Is left speaker connector on logic board damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 8.		

	Check	Result	Action	Code	Commodity
8.	Inspect left speaker cable and connector. Look for pinched or cut wires, wires pulled loose from their connector pins, or cracked connector housing. Also verify that speaker housing and cone membrane are not damaged or deformed.	Yes	Replace left speaker assembly. Verify issue resolved.	X09	OTHER ELECTRIC
		No	Go to step 9.		
	Is left speaker or cable damaged?				
9.	Carefully clean affected speaker cone using a soft tissue to remove dust, debris, or foreign material, e.g., metal fragments that easily adhere to magnetic speaker. Reseat left speaker connection and retest.	Yes	Issue resolved by cleaning speaker membrane. Verify resolution.		
		No	Go to step 10.		
	Is audio from left speaker free of distortion?				
10.	To troubleshoot this issue completely, a known-good left speaker is required.	Yes	Go to step 11.		
		No	Replace left speaker assembly. Verify issue resolved.	X09	OTHER ELECTRIC
	Do you have immediate access to a known-good left speaker?				
11.	Substitute a known-good left speaker to test for distortion coming from logic board.	Yes	Replace left speaker assembly. Verify issue resolved.	X09	OTHER ELECTRIC
		No	Replace logic board. Verify issue resolved.	M09	MLB
	Is audio from left speaker free of distortion?				
12.	Inspect right/subwoofer speaker set and verify speaker housing and cone membrane are not deformed or damaged.	Yes	Replace right/subwoofer speaker set assembly. Verify issue resolved.	X09	OTHER ELECTRIC
		No	Go to step 13.		
	Is right/subwoofer speaker set damaged?				
13.	Inspect and carefully clean right speaker cone using a soft tissue to remove dust, debris, or foreign material, such as metal fragments that easily adhere to magnetic speaker. Reseat right/subwoofer speaker set connection and retest.	Yes	Issue resolved by cleaning speaker membrane. Verify resolution.		
		No	Go to step 14.		
	Is audio from right/subwoofer speaker set free of distortion?				
14.	To troubleshoot this issue completely, a known-good right/subwoofer speaker set is required.	Yes	Go to step 15.		
		No	Replace right/subwoofer speaker set assembly. Verify issue resolved.	X09	OTHER ELECTRIC
	Do you have immediate access to a known-good right/subwoofer speaker set?				
15.	Substitute a known-good right/subwoofer speaker set to test for distortion coming from logic board.	Yes	Replace right/subwoofer speaker set assembly. Verify issue resolved.	X09	OTHER ELECTRIC
		No	Replace logic board. Verify issue resolved.	M09	MLB
	Is audio from right/subwoofer speaker set free of distortion?				

	Check	Result	Action	Code	Commodity
16.	Start up computer using known-good original system media or an up-to-date, bootable OS X volume. Verify if known-good USB device functions correctly and is recognized in System Information (System Profiler in Snow Leopard) > USB. Compare same audio using internal speakers and known-good headphones or external speakers.	Yes	Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> and reinstall correct OS X build. Verify resolution.		
	Is audio audible, clear, and free of distortion when starting up from known-good OS?	No	Replace logic board. Verify issue resolved.	M09	MLB
17.	Reset balance slider to center. Play a known-good audio file and verify that audio from all speakers is audible, clear, and free of distortion.  Is issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	



# External Apple Bluetooth Peripherals

## Unlikely causes:


Not relevant


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Apple Bluetooth keyboard, mouse, or trackpad will not pair with known-good computer.</li><li>Apple Bluetooth device intermittently loses its connection.</li><li>Data transfer with Apple Bluetooth device is too slow or times out.</li><li>Apple Wireless Mouse or Magic Trackpad causes erratic cursor tracking</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none"><li>Check for and apply the latest software and firmware updates.</li><li>In System Preferences / System Profiler, make sure Bluetooth is on and set to Discoverable.</li><li>If the device does not power on, install new or freshly charged batteries.</li><li>Attempt to pair user's Bluetooth device with known-good computer, using Apple Support article <a href="#">TS3048: Troubleshooting wireless mouse and keyboard issues</a>.</li><li>Reset Bluetooth device or delete pairing (if applicable).</li><li>If Bluetooth pairs normally at your service location, research potential sources of interference in the user's environment, such as microwave ovens or cordless phones in the 2.4/5GHz range. See Apple Support article <a href="#">HT1365: Wi-Fi and Bluetooth: Potential sources of wireless interference</a>.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Confirm that the device is one of the following: <ul style="list-style-type: none"><li>Apple Magic Mouse (Late 2009) and newer</li><li>Apple Wireless Keyboard (Late 2009) and newer</li><li>Apple Magic Trackpad</li></ul> <p>Is the Bluetooth device one of these models?</p>	Yes	Go to step 2.		
		No	Advise user to consult Apple Support article <a href="#">TS3048: Troubleshooting wireless mouse and keyboard issues</a> , or for 3rd-party devices, contact the manufacturer for support, software/firmware updates, or service options.		

	Check	Result	Action	Code	Commodity
2.	<p>Test the device with the latest version of <b>Bluetooth Diagnostics Utility</b>. If a fault is detected, record the Diagnostic Receipt Code.</p> <p>Does the device pass all Bluetooth Diagnostics Utility tests?</p>		 <p><b>ESCALATION REQUIRED.</b></p> <p>Bluetooth device appears to be performing to specifications. There may be an issue with the user's computer, or Bluetooth interference in the user's environment.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
		Yes			
		No	Go to step 3.		
3.	<p><b>Bluetooth Diagnostics Utility</b> can verify communication to an Apple Wireless Keyboard, Magic Mouse, or Magic Trackpad. Identify wireless device being tested.</p> <p>Are we testing an Apple Wireless Keyboard or a Magic Mouse/Trackpad?</p>	Apple Wireless Keyboard	Go to step 4.		
		Apple Magic Mouse/Trackpad	Go to step 5.		
4.	<p>Refer to Apple Support article <a href="#">OP52: Bluetooth Keyboard, Mouse and Magic Trackpad Screening Process</a> and specify the fault reported by the Bluetooth Diagnostics Utility.</p> <p>Which symptom describes the fault?</p>	Device Loses Connection	Replace Apple Wireless Keyboard. <b>Enter the Diagnostic Receipt Code as required.</b> Verify issue resolved.	K08	KEYBOARD
		Device Cannot Pair	Replace Apple Wireless Keyboard. <b>Enter the Diagnostic Receipt Code as required.</b> Verify issue resolved.	K07	KEYBOARD
5.	<p>Refer to Apple Support article <a href="#">OP52: Bluetooth Keyboard, Mouse and Magic Trackpad Screening Process</a> and specify the fault reported by the Bluetooth Diagnostics Utility.</p> <p>Which symptom describes the fault?</p>	Device Loses Connection	Replace Bluetooth device. <b>Enter the Diagnostic Receipt Code as required.</b> Verify issue resolved.	K08	MOUSE
		Device Cannot Pair	Replace Bluetooth device. <b>Enter the Diagnostic Receipt Code as required.</b> Verify issue resolved.	K07	MOUSE

	Check	Result	Action	Code	Commodity
6.	Pair the replacement Bluetooth device with a known-good computer. Verify that the device sustains a connection for several minutes without error.  Is the issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

# External Apple Wired Keyboard and Mouse

## Unlikely causes:

Not relevant


## Quick Check

Symptoms	Quick Check
<p>Apple wired USB keyboard or mouse does not function with user's computer, or shows one or more of the following symptoms:</p> <ul style="list-style-type: none"><li>• Mouse button(s) does not click</li><li>• Mouse scroll ball does not operate smoothly</li><li>• No mouse response</li><li>• Keyboard keys stick</li><li>• Keyboard keys loose or missing</li><li>• One or more keys do not respond when pressed</li><li>• No keyboard response at all</li><li>• Apple wired mouse causes erratic cursor tracking</li><li>• Apple wired keyboard or mouse is not recognized</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none"><li>1. Try the steps suggested in Apple Support article <a href="#">HT1151: USB and FireWire Quick Assist</a>.</li><li>2. Disconnect all other USB devices from the user's computer except the user's mouse or keyboard. Troubleshoot only one device at a time to help isolate the issue.</li><li>3. Unplug the keyboard or mouse from the USB port, wait a few seconds, and reconnect it.</li><li>4. Connect the keyboard or mouse to another USB port on the user's computer.</li><li>5. Make sure the USB connectors are plugged in completely and correctly.</li><li>6. Visually inspect the USB connectors and ports for damage or debris.</li><li>7. Try operating the user's mouse on another surface. Ask the user about the type of surface usually being used with the mouse. Glossy or transparent surfaces, or those with repetitive patterns, may cause mouse-tracking errors or faulty mouse operation. Explain that solid, non-reflective, opaque surfaces work best. The surface should be clean, but not shiny.</li><li>8. Visually inspect the user's keyboard or mouse for dirt, hair, liquid damage, or other debris. Check to see if the user has pets. Pet hair can lay across the laser and cause intermittent mouse issues. Refer to Apple Support article <a href="#">HT3226: How to clean Apple products</a> for information on cleaning the user's keyboard or mouse.</li><li>9. Connect the user's USB keyboard or mouse to a free USB port on a known-good computer to determine if the issue is related to the USB port on the user's computer, or to the user's USB keyboard or mouse. If the user's keyboard or mouse functions when used with a known-good computer, go to the "USB Port Not Recognized" troubleshooting flow.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Visually inspect the user's USB mouse or keyboard to verify that the attached USB cable and/or connector is not damaged or frayed.	Yes	Go to step 2.		
	<p>Check the user's keyboard or mouse for physical and/or liquid damage.</p> <p>On mice, verify that all mouse buttons click and the laser tracking LED illuminates.</p> <p>On keyboards, verify that all keyboard buttons are present and can be depressed normally.</p> <p>Does the user's USB mouse or keyboard, or its attached cable or connector, show signs of damage?</p>	No	Go to step 6.		

	Check	Result	Action	Code	Commodity
2.	Isolate the damage issue to either the user's wired USB keyboard or mouse.  Which peripheral is damaged?	USB Keyboard	Go to step 3.		
		USB Mouse	Replace USB mouse. Verify issue resolved.  <b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K15	MOUSE
3.	Closely examine the user's keyboard to determine the exact nature of its issue.  Look for any signs of liquid spill, liquid penetration, or liquid damage to the keyboard.  Is damage to the user's keyboard related to liquid spill?	Yes	Replace USB keyboard. Verify issue resolved.  <b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K90	KEYBOARD
		No	Go to step 4.		
4.	Click each key to ensure all keys are not sticking in the down or up position.  Is damage to the user's keyboard related to sticky keys or slow key response?	Yes	Replace USB keyboard. Verify issue resolved.  <b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K05	KEYBOARD
		No	Go to step 5.		
5.	Look for any loose or missing keycaps.  Is damage to the user's keyboard related to loose or missing keycaps?	Yes	Replace USB keyboard. Verify issue resolved.  <b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K27	KEYBOARD
		No	Replace USB keyboard. Verify issue resolved.  <b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K16	KEYBOARD
6.	Isolate the failure issue to either the user's wired USB keyboard or mouse.  Which peripheral is malfunctioning?	USB Keyboard	Replace USB keyboard. Verify issue resolved.	K15	KEYBOARD
		No	Go to Step 7.		

	Check	Result	Action	Code	Commodity
7.	Click and roll the mouse's scroll ball to check that it rolls freely in all directions, with no physical resistance.  Is the issue related to the scroll ball?	Yes	Replace USB mouse. Verify issue resolved.	K06	MOUSE
		No	Go to step 8.		
8.	Click the mouse's various buttons to verify they click properly, without sticking, each time they are pressed.  Is the issue related to the mouse button(s)?	Yes	Replace USB mouse. Verify issue resolved.	K14	MOUSE
		No	Replace USB mouse. Verify issue resolved.	K26	MOUSE
9.	Verify that the user's USB keyboard or mouse continues to function properly with the user's computer.  Is the issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): FireWire Port Does Not Recognize Devices

## Unlikely causes:


AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, speakers, top case, trackpad

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Computer has a FireWire port, but does not recognize FireWire devices such as digital cameras or hard drives.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Some early models may not have a FireWire port. Check for presence of a FireWire port on this computer model.</li><li>Check for and apply latest software and firmware updates.</li><li>Check System Information (System Profiler in Snow Leopard) to verify that computer recognizes FireWire bus.</li><li>Verify FireWire port by connecting to a known-good computer using FireWire target disk mode.</li><li>Try with a known-good FireWire cable.</li><li>Verify that bus-powered FireWire devices are receiving adequate power from the computer.</li><li>Review <a href="#">HT1151: USB and FireWire Quick Assist</a> with the user and verify manufacturer's minimum system requirements for the device.</li><li>Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model. Proper build has FireWire drivers that match logic board FireWire controller.  Is proper OS installed?	Yes	Go to step 2.		
		No	Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> and reinstall correct OS X build for this computer model. Verify issue resolved.		
2.	Check System Information > Hardware > FireWire. While no device is connected, FireWire controller should be listed as following:  <b>FireWire Bus:</b>  Maximum Speed: Up to 800 Mb/sec  Does System Information list FireWire controller?	Yes	Go to step 3.		
		No	Replace logic board. Verify issue resolved.	M12	MLB

	Check	Result	Action	Code	Commodity
3.	<p>To continue troubleshooting this issue, the following known-good parts are required:</p> <ul style="list-style-type: none"> <li>Known-good, bus-powered FireWire 400/800 device, such as a hard drive or camera</li> <li>Known-good FireWire 800 cable, or FireWire 800-to-400 adapter with FireWire cable</li> </ul> <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 4.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
4.	<p>Connect known-good, bus-powered FireWire device with known-good FireWire cable or adapter/cable combination. Verify that FireWire device mounts to the desktop or is available in the application that supports the device (e.g., iMovie, QuickTime, or Photo Booth).</p> <p>Does known-good FireWire device / cable combination mount to desktop?</p>	Yes	Go to step 5.		
		No	<p>Replace logic board.</p> <p>Verify issue resolved.</p>	M12	MLB
5.	<p>Continue to use known-good FireWire device, and connect device with user's FireWire cable or adapter/cable combination. Verify that FireWire device mounts to desktop or is available in the application that supports the device (e.g., iMovie, QuickTime, or Photo Booth).</p> <p>Does known-good FireWire device mount to desktop with user's cable?</p>	Yes	Go to step 6.		
		No	<p>Have user replace FireWire adapter and/or FireWire cable set.</p>		
6.	<p>Connect user's FireWire device and cable or adapter/cable combination. Verify that FireWire device mounts to desktop or is available in the application that supports the device (e.g., iMovie, QuickTime, or Photo Booth).</p> <p>Does user's FireWire device/cable combination mount to desktop?</p>	Yes	Issue resolved. Verify resolution.		
		No	<p>Review Apple Support article <a href="#">HT1151: USB and FireWire Quick Assist</a> with user and verify manufacturer's minimum system requirements for the device. Verify issue resolved.</p>		



	Check	Result	Action	Code	Commodity
7.	<p>Verify that the connected FireWire device is recognized by the computer.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX Toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Internal Microphone Issues

## Unlikely causes:


AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, speakers, top case, trackpad

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Microphone not working.</li><li>Microphone audio garbled.</li><li>Line audio input functions properly.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<p>1. On user's computer, go to System Preferences &gt; Sound.</p> <p><b>Select Input tab and verify:</b></p> <ul style="list-style-type: none"><li>Internal microphone source is available and selected.</li><li>Input volume slider is not set to zero.</li><li>The Use ambient noise reduction checkbox is unchecked.</li></ul> <p><b>Select Output tab and verify:</b></p> <ul style="list-style-type: none"><li>Sound output device is set to Internal Speakers.</li><li>Output volume is not muted or set to zero.</li></ul> <p>2. Go to System Preferences &gt; Sound &gt; Input. Verify Input level indicator moves when speaking into microphone.</p> <p>3. Make sure no cables are inserted into audio input or output jacks. Use an otoscope to visually inspect both jacks. Use compressed air to clean and remove any debris.</p> <p>4. Reset PRAM by holding down Command (⌘) + Option-P-R keys while restarting, until you hear startup sound a second time.</p> <p>5. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model. Update or restore if needed.</p>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Go to System Preferences > Sound > Input tab and verify Internal microphone input source is displayed.	External	Go to step 2.		
	Does System Preferences > Sound > Input tab show Internal or External microphone available?	Internal	Go to step 3.		
2.	Connect a pair of Apple earphones to audio out port and quickly disconnect. In System Preferences > Sound > Input tab, verify Internal microphone input source is displayed.	External	Replace logic board. Verify issue resolved.	M09	MLB
	Does System Preferences > Sound > Input tab show Internal or External microphone available?	Internal	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	Go to System Preferences > Sound > Input tab and verify following: <ul style="list-style-type: none"> <li>Input volume slider is not set to zero.</li> <li>Input level indicator shows activity when speaking into microphone.</li> </ul> Does Input level indicator move when speaking into microphone?	Yes	Go to step 5.		
		No	Go to step 4.		
4.	Remove logic board and verify following: <ul style="list-style-type: none"> <li>Microphone is present.</li> <li>Cable and connector are free of damage.</li> <li>Cable connector is correctly seated on logic board.</li> </ul> Reassemble and test. Go to System Preferences > Sound > Input tab and verify following: <ul style="list-style-type: none"> <li>Internal microphone device is available and selected.</li> <li>Input level indicator shows activity when speaking into microphone.</li> </ul> Does Input level indicator move when speaking into microphone?	Yes	Issue resolved by reseating microphone cable connection to logic board and/or by reseating other logic board connectors. Verify Issue resolved.		
		No	Replace microphone. Verify issue resolved.	X19	OTHER ELECTRIC
5.	Record audio sample using GarageBand or QuickTime Player. Verify quality of audio sample during playback.  Is quality of audio sample normal during playback?	Yes	Issue resolved. Verify resolution.		
		No	Go to “Distorted Audio from Internal Speaker(s)” troubleshooting flow.		
6.	Verify Internal microphone device is available, selected, and functional, and that audio playback is free of distortion.  Is issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): No Audio from Internal Speaker(s) or Headphone Jack

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fans, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, top case, trackpad

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>No sound from subwoofer speaker</li><li>No sound from left and/or right speaker</li><li>No sound from headphone jack</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>In System Preferences &gt; Sound &gt; Output, check that sound output device is set to "Internal Speakers" and that Balance slider is set halfway between "left" and "right."</li><li>Press F12 key several times to increase volume to maximum.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Check for and apply latest software and firmware updates.</li><li>Start up computer using known-good original system media or an up-to-date, bootable OS X volume, and retest.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Disconnect any external audio devices. In System Preferences > Sound > Output, verify that "Internal Speakers" is available and selected in the "Select a device for sound output" box. Make sure no other external device (External Speakers, Digital Out, Headphones, or USB audio devices) replaces this internal speaker setting.	Yes	Go to step 2.		
	Does Sound Preferences list a device that isn't connected?	No	Go to step 5.		
2.	Using known-good headphones or external speakers, insert and remove plug from audio-out port several times. Reconnect headphones or speakers and verify that you can hear a clear audio signal through them.	Yes	Go to step 4.		
	Can you hear audio through headphones/external speakers?	No	Go to step 3.		
3.	Insert headphone or speaker plug into audio-out port and then loosen logic board screws just enough to slide the board toward the edge of the top case. Try to insert plug more deeply into the port. Tighten logic board screws. Retest.	Yes	Go to step 4.		
	Can you hear audio through headphones/external speakers?	No	Replace logic board. Verify issue resolved.	M09	MLB

	Check	Result	Action	Code	Commodity
4.	When headphone plug is disconnected from the jack, System Preferences > Sound > Output should automatically switch back to "Internal Speakers".  Does sound output consistently switch back to Internal Speakers when headphone plug is removed?	Yes	Go to step 5.		
		No	Replace logic board. Verify issue resolved.	M09	MLB
5.	With all external audio devices disconnected, play a known-good audio file and verify that sound is audible from all internal speakers.  High range tones come from left and right speakers mounted under top case just below keyboard. Lower and mid-range tones come from rear speaker (subwoofer), located in its own housing under right side of keyboard (depending on model, it is located along one or the other edge of the optical drive).  Can you detect audio playback from all three internal speakers?	Yes	Go to step 7.		
		No	Go to step 6.		
6.	Determine if audio is transmitted from some but not all speakers, or no speakers at all.  Can you hear audio from any internal speakers?	Yes	Go to step 10.		
		No	Go to step 8.		
7.	Play a few different audio tracks with varied tonal ranges to verify that each speaker reproduces clear sound, with no distortion, buzz, pops, or dropouts.  Do all three speakers produce clear, distortion-free sound?	Yes	Issue resolved. Verify resolution.		
		No	Go to "Distorted Audio from Internal Speaker(s)" troubleshooting flow.		
8.	Inspect both left speaker and right/subwoofer speaker set cables and connectors for damage. Look for pinched wires, wires pulled loose from connectors, or cracked connector housing that won't stay seated in logic board connector.  Are there any visible signs of connector or speaker cable damage?	Yes	Go to step 12.		
		No	Go to step 9.		
9.	Reseat all three speaker cable connections to logic board. Retest left speaker and right/subwoofer speaker set.  Can you hear audio from any internal speakers?	Yes	Go to step 10.		
		No	Go to step 20.		
10.	Verify if sound output is audible from all three speakers.  Can you hear audio from all internal speakers simultaneously?	Yes	Go to step 7.		
		No	Go to step 11.		

	Check	Result	Action	Code	Commodity
11.	Using sound balance and a range of audio tones, determine which speaker or speaker set is defective.>  Identify which speaker or speaker set is defective.	Right/Subwoofer Speaker Set	Go to step 13.		
		Left Speaker	Go to step 16.		
12.	Inspect both left and right/subwoofer speaker set connectors on logic board for damage. Look for broken or loose connectors, crushed pins, or missing connector housing.  Are any speaker connector ports on logic board damaged?	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 15.		
13.	Inspect right/subwoofer speaker set cable and connector and its corresponding logic board port. Reseat connection to logic board and retest. Verify that low frequency tones are audible from rear (subwoofer) speaker.  Can you hear audio from right and rear (subwoofer) speakers?	Yes	Issue resolved by reseating right/subwoofer speaker set cable. Verify resolution.		
		No	Go to step 14.		
14.	To troubleshoot this issue completely, a known-good right/subwoofer speaker set is required.  Do you have immediate access to a known-good right/subwoofer speaker set?	Yes	Go to step 17.		
		No	Replace right/subwoofer speaker set. Verify issue resolved.	X08	OTHER ELECTRIC
15.	Identify which cable or connector is damaged: left speaker or right/subwoofer speaker set.  Is damage located on left speaker or right/subwoofer speaker set?	Right/Subwoofer Speaker Set	Replace right/subwoofer speaker set. Verify issue resolved.	X08	OTHER ELECTRIC
		Left Speaker	Replace left speaker. Verify issue resolved.	X08	OTHER ELECTRIC
16.	Reseat left speaker cable connection to logic board and retest. Verify that sound is clearly audible through left speaker.  Can you hear audio from left speaker?	Yes	Issue resolved by reseating left speaker cable. Verify resolution.		
		No	Go to step 18.		
17.	Substitute known-good right/subwoofer speaker set and retest. Verify that low frequency tones are audible from rear speaker.  Can you hear audio from all speakers?	Yes	Replace right/subwoofer speaker set. Verify issue resolved.	X08	OTHER ELECTRIC
		No	Replace logic board. Verify issue resolved.	M09	MLB
18.	To troubleshoot this issue completely, a known-good left speaker is required.  Do you have immediate access to a known-good left speaker?	Yes	Go to step 19.		
		No	Replace left speaker. Verify issue resolved.	X08	OTHER ELECTRIC
19.	Substitute known-good left speaker. Verify that sound is clearly audible through left speaker.  Can you hear audio from left speaker?	Yes	Replace left speaker. Verify issue resolved.	X08	OTHER ELECTRIC
		No	Replace logic board. Verify issue resolved.	M09	MLB

	Check	Result	Action	Code	Commodity
20.	To troubleshoot this issue completely, a known-good logic board is required.  Do you have immediate access to a known-good logic board?	Yes	Go to step 21.		
		No	Replace logic board. Verify issue resolved.	M09	MLB
21.	Substitute known-good logic board. Retest left speaker and right/subwoofer speaker set.  Can you hear audio from all internal speakers?	Yes	Replace logic board. Verify issue resolved.	M09	MLB
		No	Go to step 22.		
22.	Using sound balance and a range of audio tones, determine which speaker or speaker set is defective: left speaker or right/subwoofer speaker set.  Identify which speaker or speaker set set is defective.	Left Speaker	Replace left speaker. Verify issue resolved.	X08	OTHER ELECTRIC
		Right/Subwoofer Speaker Set	Replace right/subwoofer speaker set. Verify issue resolved.	X08	OTHER ELECTRIC
23.	Verify that all three speakers produce clear, distortion-free sound.  Is issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): No Audio To External Display Speakers

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fans, hard drive, heat sink, MagSafe board, memory, optical drive (if present), power adapter, top case, trackpad


## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Sound cannot be enabled on speakers of an external Thunderbolt, Mini DisplayPort or HDMI display.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>In System Preferences &gt; Sound &gt; Output, select Internal Speakers then play audio file to verify it can be played on computer.</li><li>Verify computer using known-good Mini DisplayPort or HDMI display equipped with internal speaker(s). If using a Thunderbolt display, verify computer is Thunderbolt-capable. Computers with DVI display port do not support audio out on that port.</li><li>Verify computer model supports audio on DisplayPort or HDMI. Refer to Apple Support article <a href="#">HT4241: About Mini DisplayPort to HDMI adapters</a>. If using a MiniDisplayPort display on earlier models, verify display's USB cable is also connected.</li><li>If using a Mini DisplayPort-to-HDMI adapter, verify adapter supports audio on HDMI. Refer to Apple Support article <a href="#">HT4241: About Mini DisplayPort to HDMI adapters</a>.</li><li>If using an HDMI display, choose Input Menu to select the specific HDMI input where the cable is connected.</li><li>In System Preferences &gt; Displays verify external display is detected and enabled.</li><li>In System Preferences &gt; Sound &gt; Output, select the available DisplayPort, HDMI or USB Output device type, (depending on computer, display model, and connection).</li><li>In System Preferences &gt; Sound &gt; Output adjust Output volume and Balance levels.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>Test audio output using more than one application or website.</li><li>Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>display connected to computer, check for and apply latest software and firmware updates.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Connect a known-good display, display cable, and adapter (if needed) to a known-good similar-generation computer. Check System Preferences > Sound > Output for an available DisplayPort, HDMI, or USB Output device type. Select available device type, adjust output volume level, and play audio file/source.	Yes	Go to step 3.		
		No	Go to step 2.		
	Can external display audio be enabled and play audio on known-good computer?				



	Check	Result	Action	Code	Commodity
2.	<p>Computer model or test setup does not support audio through display port (Mini DisplayPort, Thunderbolt, or HDMI) . Check each element feature and audio support compatibility.</p> <p>Locate adequate known-good computer model, display, cable and adapter and retest.</p> <p>Can known-good display audio be enabled and play audio on a computer model similar to user's compute</p>	Yes	Go to step 3.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
3.	<p>Connect known-good display, display cable and adapter (if needed) to user's computer. Check System Preferences &gt; Sound &gt; Output for an available DisplayPort, HDMI, or USB Output device. Select available device. Adjust Output volume level and play audio file/source.</p> <p>Can external display audio be enabled and play audio on user's computer?</p>	Yes	Go to step 5.		
		No	Go to step 4.		
4.	<p>Start up user's computer using known-good original system media or an up-to-date, bootable OS X volume.</p> <p>Check System Preferences &gt; Sound &gt; Output, for an available DisplayPort, HDMI, or USB Output device. Select available device. Adjust Output volume level and play audio file/source.</p> <p>Can external display audio be enabled and play audio when user's computer has a known-good OS?</p>	Yes	Reinstall OS X on user's computer. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model. Check for and apply latest software and firmware updates. Verify resolution.		
		No	Replace logic board. Verify issue resolved.	M09	MLB
5.	<p>Retest user's display, cable and/or adapter one at a time to identify affected element.</p> <p>Check System Preferences &gt; Sound &gt; Output, for an available DisplayPort, HDMI, or USB Output device type. Select available device. Adjust Output volume level and play audio file/source.</p> <p>Can external display audio be enabled and play audio on user's computer?</p>	Yes	Issue resolved. Verify issue resolved.		
		No	Go to step 6.		
6.	<p>User's external display, cable and/or adapter appears to be causing issue.</p> <p>What is the product brand?</p>	Third party display, cable, or adapter	Refer user to contact product manufacturer for further compatibility, software requirements information, or service.		
		Apple display, cable, or adapter	Go to step 7.		

	Check	Result	Action	Code	Commodity
7.	<p>Issue appears to be related to an Apple product. Specify the product type.</p> <p>What is the type of Apple product?</p>	Apple cable or adapter	Check for possible accidental damage. Replace the Apple cable or adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		Apple display	Return computer to user. Enter Apple display serial number into GSX, locate its service guide, and troubleshoot display using a known-good computer.		
8.	<p>Play a known-good audio file/source and verify that sound output to all speakers is audible.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): No Video to External Display


## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan(s), hard drive / solid-state drive (SSD), heat sink, power adapter, top case, trackpad

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>External display is not detected when connected to computer</li><li>External display does not show any video</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>1. Connect a known-good, compatible external display to computer's video-out port. Review Apple Support article <a href="#">HT3235: Monitor and display adapter table</a> to help identify which adapters can be used with this computer model.</li><li>2. If using an Apple Thunderbolt Display, review Apple Support article <a href="#">HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ)</a> to identify which computer models support it.</li><li>3. If using an Apple Thunderbolt Display, note that some computers support only one display. Other computers support a daisy chain of two displays. Refer to Apple Support article <a href="#">HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ)</a>.</li><li>4. Review Apple Support article <a href="#">HT1573: Apple computers: Troubleshooting issues with video on internal or external displays</a> for common causes of video issues.</li><li>5. Launch System Information (System Profiler in Snow Leopard) &gt; Graphics/Displays. Select video card where internal Color LCD display is connected. Verify external display hardware is recognized.</li><li>6. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>7. Check for and apply latest software and firmware updates to all involved computers and displays.</li><li>8. Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time. Refer to Apple Support article <a href="#">HT1895: When to reset NVRAM or PRAM</a>.</li><li>9. If using with a computer set in target display mode, reset SMC on the computer used as a display. Refer to Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>10. If using an Apple Thunderbolt Display, review Apple Support article <a href="#">HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ)</a> to verify computer has latest Thunderbolt firmware version installed. Also review Apple Support article <a href="#">HT4614: About Thunderbolt to Thunderbolt cable (2 m)</a> for details on Thunderbolt cable usage and supported configurations.</li><li>11. If using a Mini DisplayPort adapter, review Apple Support article <a href="#">HT3382: Apple Mini DisplayPort adapters: Frequently asked questions (FAQ)</a>, for details on supported configurations.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect video-out port for damage, or bent pins that might cause display cable to create shorts or make insufficient contact.  Is video-out port damaged?	Yes	Go to step 2.		
		No	Go to step 4.		
2.	Inspect logic board, video-out port and enclosure for dents, scratches, or other indications of impact or abuse.  Does accidental damage appear to be cause of issue?	Yes	Go to step 3.		
		No	Replace logic board. Verify issue resolved.	M24	MLB
3.	Using Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a> as a guide, inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options. Refer to <a href="#">OP18: SERVICE: Accidental Damage Repair Pricing for Mail-In Portables and Displays</a> for pricing.  Does user want to proceed with out-of-warranty repair?	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Issue resolved. Return computer to user with correct positioning.		
4.	Inspect video-out port for dust or debris that might cause display cable to make insufficient contact. Use compressed air to remove any debris.  Retest with known-good display.  Does this resolve issue?	Yes	Issue resolved. Return computer to user.		
		No	Go to step 5.		
5.	Connect known-good, compatible external display. Start up from a known-good bootable OS X volume and check System Information > Graphics/Displays for presence of external display connected to graphics card.  Is external display detected?	Yes	Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> and reinstall correct OS X build for this computer model. Verify issue resolved.		
		No	Replace logic board. Verify issue resolved.	M26	MLB
6.	Connect a known-good, compatible display to computer and verify that:  <ul style="list-style-type: none"> <li>display is functional at computer startup</li> <li>display is functional after computer is put to sleep and then awakened</li> <li>other display features are also available (depending on display model: USB, audio, USB, Ethernet, etc.)</li> </ul> Is issue resolved?	Yes	Issue resolved.		
		No	 <b>ESCALATION REQUIRED.</b>  Contact TSPS for additional support or a multiple-part repair.  Click Help button in GSX toolbar. Select Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

# Thunderbolt Cable Connectivity Issues


## Unlikely causes:

Not relevant

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Unable to access Thunderbolt peripherals.</li><li>• Thunderbolt shows no connection.</li><li>• Slow Thunderbolt performance.</li></ul> <p><b>Note:</b> These symptoms address issues with the Thunderbolt cable, not the computer's Thunderbolt port. If you suspect an issue with the computer after attempting Quick Check steps that follow, please back up and click on the 'Troubleshoot another issue' button to select a functional area and issue that addresses issues with computer's Thunderbolt port instead.</p> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none"><li>1. Check manufacturer's minimum system requirements for connectivity to user's Thunderbolt peripheral. Refer to Apple Support article <a href="#">HT4614: About Thunderbolt to Thunderbolt cable (2 m)</a>.</li><li>2. Check Thunderbolt presence in System Information. Complete following steps:<ul style="list-style-type: none"><li>• Connect user's Thunderbolt cable to available Thunderbolt port on user's computer or known-good computer supporting Thunderbolt.</li><li>• Connect opposite end of user's Thunderbolt cable to known-good Thunderbolt peripheral, such as:<ul style="list-style-type: none"><li>◦ Known-good computer supporting Thunderbolt target disk mode</li><li>◦ Apple Thunderbolt Display</li><li>◦ Other known-good Thunderbolt peripheral</li></ul></li><li>• Power on connected equipment and start up user's computer.</li><li>• Launch System Information. Verify computer's Thunderbolt port and cable connection status appear in System Information &gt; Hardware &gt; Thunderbolt. Link status should be: <b>2</b> (connected), not <b>7</b> (not connected).</li></ul></li><li>3. Reverse Thunderbolt cable. Connect other end of cable to user's computer. Repeat step 2 above to check for Thunderbolt presence.</li><li>4. Disconnect user's Thunderbolt cable and reconnect to another available Thunderbolt port on user's computer (if available). Repeat step 2 to check for Thunderbolt presence.</li><li>5. Substitute known-good Thunderbolt to Thunderbolt cable (2m). Repeat step 2 to check for Thunderbolt presence.</li><li>6. Shut down user's computer, wait a few seconds, then restart it. Repeat step 2 to check for Thunderbolt presence.</li><li>7. Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>8. Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time. Repeat step 2 to check for Thunderbolt presence.</li><li>9. Check for and apply the latest software and firmware updates. Repeat step 2 to check for Thunderbolt presence.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Inspect both Thunderbolt cable connectors for dust, debris, damage, bent pins, or other indications of accidental damage. Use compressed air to remove debris.</p> <p>Closely inspect cable for signs of damage, excessive wear, kinks, breaks, bends, knots, being wound too tight, etc.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 2.		
		No	Go to step 3.		
2.	<p>Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p> <p>Refer to Apple Support article <a href="#">OP18: SERVICE: Accidental Damage Repair Pricing for Mail-In Portables and Displays</a> for pricing.</p> <p>Does user want to proceed with out-of-warranty repair?</p>	Yes	Replace Thunderbolt cable. Verify issue resolved.	X26	EXTERNAL CABLE
		No	Issue resolved. Return computer to user using correct positioning.		
3.	<p>Inspect user's Thunderbolt cable connectors connectors, and cable itself, for signs of excessive and/or unusual heat dissipation during operation.</p> <p>Perform this check only after cable has been connected to a powered computer port for at least 2 minutes.</p> <p>Did you find any signs of excessive heat in any part of the Thunderbolt cable or connector ends?</p>	Yes	Replace Thunderbolt cable. Verify issue resolved.	X85	EXTERNAL CABLE
		No	Replace Thunderbolt cable. Verify issue resolved.	X26	EXTERNAL CABLE
4.	<p>Verify connected Thunderbolt peripheral is recognized by computer when connected by user's Thunderbolt cable.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

# Thunderbolt FireWire Adapter Connectivity Issues

## Unlikely causes:

Not relevant

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>No FireWire port present.</li><li>Unable to access FireWire resources.</li><li>FireWire shows no connection.</li><li>Slow FireWire performance.</li></ul> <p><b>Note:</b> These symptoms address issues with the Thunderbolt FireWire Adapter, not the computer's Thunderbolt port. If you suspect an issue with the computer after attempting Quick Check steps that follow, please back up and click on 'Troubleshoot another issue' button to select a functional area and issue that addresses issue with computer's Thunderbolt port instead.</p> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none"><li>Launch System Information. Verify computer's FireWire port presence in System Information &gt; Hardware &gt; FireWire. Verify Thunderbolt FireWire Adapter presence in System Information &gt; Hardware &gt; Thunderbolt.</li><li>Try known-good Thunderbolt FireWire Adapter, FireWire hardware and cable with user's computer.</li><li>Using known-good Thunderbolt FireWire Adapter, FireWire hardware and cable, start up computer using Lion Recovery or an up-to-date, bootable OS X volume. Hold down Command (⌘) + R during startup to restart from the recovery partition. See Apple Support article <a href="#">HT4718: OS X: About OS X Recovery</a>. Repeat step 1 above to check for Thunderbolt and FireWire presence.</li><li>Verify bus-powered FireWire devices are receiving adequate power from computer.</li><li>Check manufacturer's minimum system requirements for device. Refer to Apple Support article <a href="#">HT1151: USB and FireWire Quick Assist</a>.</li><li>Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.</li><li>Check for and apply the latest software and firmware updates.</li></ol>


## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect Thunderbolt FireWire Adapter connectors, cable, and body for dust, debris, damage, bent pins, or other indications of accidental damage. Use compressed air to remove debris.	Yes	Go to step 2.		
		No	Go to step 3.		
	Did you find any damaged components?				
2.	Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	Yes	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X26	EXTERNAL CABLE
	Refer to Apple Support article <a href="#">OP18: SERVICE: Accidental Damage Repair Pricing for Mail-In Portables and Displays</a> for pricing.	No	Issue resolved. Return computer to user using correct positioning.		
	Does user want to proceed with out-of-warranty repair?				

	Check	Result	Action	Code	Commodity
3.	<p>Connect user's Thunderbolt FireWire Adapter to an available Thunderbolt port on user's computer. Start up computer completely and launch System Information.</p> <p>Verify FireWire port presence in System Information &gt; Hardware &gt; FireWire.</p> <p>Verify Thunderbolt FireWire Adapter presence in System Information &gt; Hardware &gt; Thunderbolt.</p> <p>Does user's Thunderbolt FireWire Adapter appear in both areas of System Information?</p>	Yes	Go to step 6.		
		No	Go to step 4.		
4.	<p>To troubleshoot this issue completely, a known-good Thunderbolt FireWire Adapter is required.</p> <p>Do you have immediate access to a known-good Thunderbolt FireWire Adapter?</p>	Yes	Go to step 5.		
		No	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
5.	<p>Substitute a known-good Thunderbolt FireWire Adapter.</p> <p>Repeat System Information presence checks from previous steps using user's computer.</p> <p>Does known-good Thunderbolt FireWire Adapter now appear in both areas of System Information?</p>	Yes	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
6.	<p>To continue troubleshooting this issue, the following known-good parts are required:</p> <ul style="list-style-type: none"> <li>• FireWire 400/800 device, for example, hard drive or camera</li> <li>• FireWire 800 cable, or FireWire 800-to-400 adapter with FireWire cable</li> </ul> <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 7.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	



	Check	Result	Action	Code	Commodity
7.	<p>Connect user's Thunderbolt FireWire Adapter to an available Thunderbolt port on user's computer. Connect adapter's FireWire port to a known-good, bus-powered FireWire device with a known-good FireWire cable or adapter/cable combination.</p> <p>Start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device, for example, iMovie, QuickTime, or Photo Booth.</p> <p>Does known-good FireWire device/cable combination mount to desktop or appropriate application?</p>	Yes	Go to step 10.		
		No	Go to step 8.		
8.	<p>To troubleshoot this issue completely, a known-good Thunderbolt FireWire Adapter is required.</p> <p>Do you have immediate access to a known-good Thunderbolt FireWire Adapter?</p>	Yes	Go to step 9.		
		No	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
9.	<p>Substitute a known-good Thunderbolt FireWire Adapter.</p> <p>Using same computer, cable, and external FireWire device, start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device, for example, iMovie, QuickTime, or Photo Booth.</p> <p>Does known-good FireWire device/cable combination now mount to desktop or appropriate application?</p>	Yes	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
10.	<p>Connect user's Thunderbolt FireWire Adapter to an available Thunderbolt port on user's computer. Connect user's FireWire cable or adapter/cable combination to known-good FireWire device and user's Thunderbolt FireWire Adapter.</p> <p>Start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device.</p> <p>Does known-good FireWire device mount to desktop with user's cable?</p>	Yes	Go to step 11.		
		No	Advise user to replace their FireWire adapter and/or FireWire cable set.		

	Check	Result	Action	Code	Commodity
11.	<p>Connect user's FireWire device and cable or adapter/cable combination.</p> <p>Start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device, for example, iMovie, QuickTime, or Photo Booth.</p> <p>Does user's FireWire device/cable combination mount to desktop or appropriate application?</p>	Yes	Issue resolved. Verify resolution.		
		No	Review Apple Support article <a href="#">HT1151: USB and FireWire Quick Assist</a> with user. Check manufacturer's minimum system requirements for device. Verify issue resolved.		
12.	<p>Verify connected FireWire device is recognized by computer.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Thunderbolt Not Recognized

## Unlikely causes:



AirPort/Bluetooth card, battery, bottom case, display clamshell, fans, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, top case, trackpad

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Computer does not recognize Thunderbolt devices.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check for presence of a lightning icon near port(s), to confirm that computer supports Thunderbolt.</li><li>Apply latest software and firmware updates. Refer to <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to verify an OS X version with Thunderbolt drivers is present to support Thunderbolt hardware.</li><li>Check System Information (System Profiler in Snow Leopard) &gt; Hardware &gt; Thunderbolt to verify Thunderbolt hardware is recognized.</li><li>Try using a known-good Thunderbolt cable. See Apple Support article <a href="#">HT4614: About Thunderbolt to Thunderbolt cable (2 m)</a>.</li><li>Try using a known-good Thunderbolt device or a Thunderbolt-ready computer started in target disk mode. Refer to Apple Support article <a href="#">PH3838: Transfer files between two computers using target disk mode</a>.</li><li>Refer to Apple Support article <a href="#">HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ)</a> for more information.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model. Correct build contains Thunderbolt drivers that match logic board Thunderbolt controller.  Is proper version of OS X installed?	Yes	Go to step 2.		
		No	Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to reinstall correct Mac OS X build and USB drivers for this computer model. Use Software Update to make sure newest versions are installed. Verify issue resolved.		
2.	Apply latest software and firmware updates. Check System Information > Hardware > Thunderbolt. If no device is connected, Thunderbolt controller should be listed as MacBook Pro with a unique user ID (UID) and firmware version shown.  Does System Information list Thunderbolt hardware?	Yes	Go to step 3.		
		No	Go to step 4.		

	Check	Result	Action	Code	Commodity
3.	<p>Connect a known-good Thunderbolt device using a known-good Thunderbolt cable. Refresh System Information &gt; Hardware &gt; Thunderbolt. Thunderbolt port status should change and show connected Thunderbolt device.</p> <p>Does System Information &gt; Hardware &gt; Thunderbolt list connected Thunderbolt device?</p>	Yes	Issue resolved. Verify resolution.		
		No	Go to step 5.		
4.	<p>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</p> <p>Does System Information list Thunderbolt hardware?</p>	Yes	Go to step 3.		
		No	Go to step 5.		
5.	<p>To troubleshoot this issue completely, a known-good logic board is required.</p> <p>Do you have immediate access to a known-good logic board?</p>	Yes	Go to step 6.		
		No	Replace logic board. Verify issue resolved.	M33	MLB
6.	<p>Substitute known-good logic board and retest. Reset PRAM again and reboot to desktop. Check System Information to verify Thunderbolt hardware.</p> <p>Does System Information list Thunderbolt hardware?</p>	Yes	Replace logic board. Verify issue resolved.	M33	MLB
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
7.	<p>Check System Information to confirm Thunderbolt hardware is recognized and has a unique UID, most recent firmware version, and correct link status.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Thunderbolt Target Disk Mode Issues

## Unlikely causes:


AirPort/Bluetooth card, battery, bottom case, display clamshell, fan, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, solid-state drive (SSD), top case, trackpad

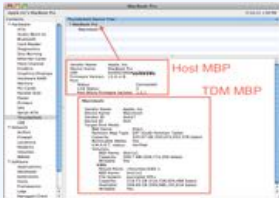

## Quick Check



Symptoms	Quick Check
<ul style="list-style-type: none"><li>Computer does not initiate Thunderbolt target disk mode connection.</li><li>Computer does not show Thunderbolt floating icon when booted with T key active.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check for and apply latest software and firmware updates. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model. The correct build contains Thunderbolt drivers that match the logic board Thunderbolt controller.</li><li>Check System Information (System Profiler in Snow Leopard) &gt; Hardware &gt; Thunderbolt to verify that Thunderbolt hardware is recognized.</li><li>Review Apple Support article <a href="#">HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ)</a> to verify computer has latest Thunderbolt firmware version installed.</li><li>Between like models, if you have both a Thunderbolt and a FireWire cable connected and enter target disk mode, the Thunderbolt-enabled device will be the default. If you disconnect either a Thunderbolt or FireWire storage device after successfully entering target disk mode, the corresponding icon should disappear from the display. See Apple Support article <a href="#">HT4614: About Thunderbolt to Thunderbolt cable (2m)</a>.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model. The correct build contains Thunderbolt drivers that match the logic board Thunderbolt controller.  Is proper OS version installed?	Yes	Go to step 2.		
		No	Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to reinstall the correct system build (with Thunderbolt drivers) for this computer model. Use Software Update to make sure the newest versions are installed. Verify issue resolved.		
2.	Check for and apply the latest software and firmware updates.  Check System Information > Hardware > Thunderbolt. If no device is connected, the Thunderbolt controller should be listed as the type of computer (for example, MacBook Pro) with a unique user ID (UID) and firmware version shown.  Does System Information list Thunderbolt hardware?	Yes	Go to step 4.		
		No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound a second time.  Does System Information list Thunderbolt hardware?	Yes	Go to step 4.		
		No	Go to “Thunderbolt Not Recognized” troubleshooting flow.		
4.	Inspect Thunderbolt port on user's computer for physical damage, a burnt connector, or misalignment.  Does Thunderbolt port show any damage?	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 5.		
5.	To troubleshoot this issue completely, the following known-good parts are required: <ul style="list-style-type: none"> <li>Thunderbolt-capable Mac</li> <li>Thunderbolt to Thunderbolt cable (2 m)</li> </ul> Do you have immediate access to each of these known-good parts?	Yes	Go to step 6.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Request TSPS help checking latest updates and System Information &gt; Hardware &gt; Thunderbolt device tree.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
6.	Start up a known-good Thunderbolt-capable Mac in target disk mode by holding down the T key. Connect the known-good computer to the user's computer using a known-good Thunderbolt cable. Start up the user's computer and verify hard drive of known-good computer appears on the desktop of user's computer.  Does hard drive on known-good Mac mount to user's computer while using known-good cable?	Yes	Go to step 8.		
		No	Go to step 7.		

	Check	Result	Action	Code	Commodity
7.	<p>Verify that System Information &gt; Hardware &gt; Thunderbolt on user's computer lists Thunderbolt connection and target disk mode information for the known-good computer.</p>  <p>Does System Information list Thunderbolt target disk mode information?</p>	Yes	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support. Inform TSPS that user's computer cannot mount a known-good Thunderbolt TDM computer hard drive to the OS desktop, while it does show a Thunderbolt connection in System Information.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
		No	Replace logic board. Thunderbolt hardware is present, but not fully functioning. Verify issue resolved.	M33	MLB
8.	<p>Inspect user's Thunderbolt to Thunderbolt (2 m) cable for physical damage, such as contamination or burnt connectors on either end of the cable.</p> <p>Is user's Thunderbolt cable damaged?</p>	Yes	Replace Thunderbolt to Thunderbolt (2 m) cable. Verify issue resolved.	X26	EXTERNAL CABLE
		No	Go to step 9.		
9.	<p>Connect user's Thunderbolt to Thunderbolt cable (2 m) to both computers. Start up the known-good computer in target disk mode by holding down the T key during startup. Reboot user's computer and verify known-good computer's hard drive mounts to the desktop of user's computer.</p> <p>Does known-good computer's drive mount to user's desktop?</p>	Yes	Go to step 10.		
		No	Replace Thunderbolt to Thunderbolt cable (2 m). Verify issue resolved.	X03	EXTERNAL CABLE
10.	<p>Continue verification of user's Thunderbolt to Thunderbolt cable (2 m) cable. Start up user's computer in target disk mode by holding down the T key during startup. Reboot the known-good computer and verify that user's computer's hard drive mounts to the desktop of the known-good computer.</p> <p>Does user's computer's drive mount to known-good computer's desktop?</p>	Yes	The user's computer and Thunderbolt cable pass inspections. Thunderbolt target disk mode issue resolved.		
		No	Go to step 11.		

	Check	Result	Action	Code	Commodity
11.	<p>Substitute a known-good Thunderbolt to Thunderbolt cable (2 m) between the known-good computer and the user's computer. Restart user's computer in target disk mode by holding down the T key during startup. Reboot the known-good computer and verify that user's computer's hard drive mounts to the desktop of known-good computer.</p> <p>Does user's computer's drive mount to known-good computer's desktop?</p>	Yes	Replace the Thunderbolt to Thunderbolt cable (2 m). Verify issue resolved.	X03	EXTERNAL CABLE
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support. Inform TSPS that user's computer can mount a known-good Thunderbolt TDM computer hard drive, but cannot support being a TDM for other hosts.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
12.	<p>Check System Information to confirm that the Thunderbolt hardware is recognized and has a unique UID, the most recent firmware version, and correct link status.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	



# MacBook Pro (13-inch, 15-inch, Mid 2012): USB Port Not Recognized

## Unlikely causes:

AirPort/Bluetooth card(s), Bluetooth card, battery, bottom case, display clamshell, fans, hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, speakers, top case, trackpad


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Standard USB devices not recognized or not powered.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Disconnect all USB devices.</li><li>Connect USB device to test and verify in System Information (System Profiler in Snow Leopard) &gt; USB that connected USB device type attaches to corresponding USB bus speed: "USB Bus" for USB 1.1 devices, "USB High-Speed Bus" for USB 2 devices, and "USB Super-Speed Bus" for USB 3 devices, according to computer USB features.</li><li>Check to see if user's USB device requires a specific driver to function properly.</li><li>Check for and apply latest software and firmware updates.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.</li><li>Check System Information &gt; USB to see if computer recognizes internal USB devices (Bluetooth, keyboard/trackpad, IR, camera).</li><li>Test each USB port using a known-good Apple wired keyboard or mouse.</li><li>Verify that any USB hubs being used have sufficient power.</li><li>Start up using known-good original system media or an up-to-date, bootable OS X volume; then check System Information &gt; USB to see if computer recognizes internal USB devices.</li><li>Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> and verify that correct version and build of OS X is installed.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Disconnect all USB devices. Verify that known-good Apple wired keyboard or mouse functions correctly and is recognized in System Information > USB.	Yes	Go to step 5.		
	Is a known-good Apple USB device functional and recognized?	No	Go to step 2.		
2.	Continue to use known-good Apple wired keyboard or mouse. Start up computer using known-good original system media or an up-to-date, bootable OS X volume. Verify that known-good USB device functions correctly and is recognized in System Information > USB.	Yes	Go to step 4.		
	Is a known-good Apple USB device functional and recognized?	No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	Inspect USB ports for lint, debris, or other foreign material. Remove debris with an anti-static brush.	Yes	Issue resolved. Return computer to user. Explain that debris in USB port caused issue and suggest how to prevent future contamination.		
	Is a known-good Apple USB device functional and recognized?	No	Replace logic board. Verify issue resolved.	M15	MLB
4.	Use Disk Utility to repair disk on internal hard drive. Restart and verify that known-good USB device functions correctly and is recognized in System Information > USB.	Yes	Issue resolved by Disk Utility repair. Verify resolution.		
	Is a known-good Apple USB device functional and recognized?	No	Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> and restore USB drivers by reinstalling correct system build of OS X. Verify issue resolved.		
5.	This computer can support one high-powered USB device (e.g., iPad, iPhone, USB hard drive) at a time.	Yes	Go to step 6.		
	<p><b>Note:</b> The first USB device to draw more than 500 mA is allotted up to 1000 mA, while all subsequent devices are limited to 500 mA. See Apple Support article <a href="#">HT4049: Apple Computers and Displays: Powering peripherals through USB</a> for more information.</p> <p>Do you have immediate access to a known-good, high-powered USB device that draws over 500 mA?</p>	No	Go to step 8.		
6.	Connect known-good, high-powered USB device to one of computer's USB ports. In System Information > USB, "Current Available (mA)" and "Extra Operating Current (mA)" should each report 500 mA.	Yes	Go to step 7.		
	<p><b>Note:</b> The first USB device to draw more than 500 mA is allotted up to 1000 mA, while all subsequent devices are limited to 500 mA. Verify that USB device operates as expected.</p> <p>Does "Extra Operating Current" appear in System Information?</p>	No	Replace logic board. Verify issue resolved.	M38	MLB
7.	Connect same high-powered USB device to the next USB port. Verify nothing is plugged into other port(s). Both "Current Available (mA)" and "Extra Operating Current (mA)" should each report 500 mA in System Information. Repeat action with every available USB port.	Yes	Go to step 8.		
	<p><b>Note:</b> The first USB device to draw more than 500 mA is allotted up to 1000 mA, while all subsequent devices are limited to 500 mA. Verify USB device operates as expected.</p> <p>Does "Extra Operating Current" appear in System Information?</p>	No	Replace logic board. Verify issue resolved.	M38	MLB

	Check	Result	Action	Code	Commodity
8.	<p>Try user's USB device with a known-good computer. Verify it functions normally and is recognized in System Information &gt; USB.</p> <p>Is user's USB device functional and recognized?</p>	Yes	Issue resolved by testing USB ports and verifying user's USB device. Verify resolution.		
		No	<p>Advise user to:</p> <ul style="list-style-type: none"> <li>• contact USB device manufacturer for support</li> <li>• verify system requirements and Mac-compatibility</li> <li>• find out if the device requires additional software</li> </ul>		
9.	<ul style="list-style-type: none"> <li>• Confirm that a known-good USB device is functional and recognized.</li> <li>• Check System Information for correct power allocation to USB device.</li> </ul> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): HDD Noisy

## Unlikely causes:


AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fans, heat sink, logic board, MagSafe board, memory, optical drive, power adapter, top case, trackpad


## Quick Check

Symptoms	Quick Check
<p>Abnormal noises such as grinding, or loud, repeated clicking, or scraping sounds may be indications of a more serious issue.</p> <p><b>Note:</b> Understand which types of hard drive noise give cause for concern, and which noises can be safely ignored. The following descriptions help distinguish normal, functional hard drive sounds from noises that may indicate drive malfunction.</p> <p>Noises such as occasional quiet chirping or beeping are typically normal hard drive sounds.</p> <p>Refer to Apple Support article <a href="#">TS2354: Apple Portables: Hard drives and noises</a> to determine if noise is within expected range.</p> <p>Listen closely in a quiet environment for the following:</p> <ul style="list-style-type: none"><li>Noise during start up</li><li>Noise during operation</li><li>Noise when drive copies or saves data</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<p><b>Important:</b> Always ask if user's data has been backed up prior to repair.</p> <ol style="list-style-type: none"><li>Verify issue involves only abnormal sounds, as defined in symptoms.</li><li>Compare hard drive noise to a known-good equivalent computer. Refer to Apple Support article <a href="#">TS2354: Apple Portables: Hard drives and noises</a> to determine if noise is within expected range.</li><li>Check for and apply the latest software and firmware updates. This includes MacBook Pro Hard Drive Firmware Update 2.0. Refer to Apple Support article <a href="#">TS2838: MacBook Pro (Mid 2009): Beep or chirp sound from a 7200 RPM hard drive.</a></li><li>Refer to <a href="#">TS3794: SERVICE: MacBook Pro (15-inch, Mid 2010), MacBook Pro (15-inch, Early 2011), and MacBook Pro (15-inch, Late 2011): Faint metallic noise</a> for help in identifying whether the sound is a faint metallic sound.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Start up computer using known-good original system media or an up-to-date, bootable OS X volume. Launch Disk Utility. Does hard drive appear in Disk Utility?	Yes	Go to step 2.		
		No	Go to "Hard Drive Not Mounting / Not Recognized / Read-Write Issues" troubleshooting flow.		
2.	Verify user's hard drive S.M.A.R.T. status in Disk Utility shows as "Verified".  Is S.M.A.R.T. status verified?	Yes	Go to step 3.		
		No	Go to "Hard Drive Not Mounting / Not Recognized / Read-Write Issues" troubleshooting flow.		
3.	Select user's drive, and choose repair disk under first aid tab. Did Disk Utility complete disk repair without an error?	Yes	Go to step 5.		
		No	Go to step 4.		

	Check	Result	Action	Code	Commodity
4.	<p>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to determine correct system version for this computer model. Erase and reinstall the OS.</p> <p><b>Important:</b> Always ask if user's data has been backed up prior to repair.</p> <p>Did installation finish successfully and computer start up to the desktop?</p>	Yes	Go to step 5.		
		No	Go to "Hard Drive Not Mounting / Not Recognized / Read-Write Issues" troubleshooting flow.		
5.	<p>Restart computer and listen closely for abnormal noise.</p> <p>Has the abnormal noise been eliminated?</p>	Yes	Issue resolved. Verify resolution.		
		No	Go to step 6.		
6.	<p>Disconnect internal hard drive and start up computer using known-good original system media or an up-to-date, bootable OS X volume.</p> <p>To troubleshoot this issue completely, a known-good hard drive is required.</p> <p>Has the noise been eliminated?</p>	Yes	Go to step 8.		
		No	Go to "Noise / Hum / Vibration" troubleshooting flow.		
7.	<p>To troubleshoot this issue completely, a known-good hard drive is required.</p> <p>Do you have immediate access to a known-good hard drive?</p>	Yes	Go to step 8.		
		No	Replace hard drive. Verify issue resolved.	H06	HDD
8.	<p>Substitute a known-good hard drive and retest.</p> <p>Has the noise been eliminated?</p>	Yes	Replace hard drive. Verify issue resolved.	H06	HDD
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	H99	

	Check	Result	Action	Code	Commodity
9.	<p>Confirm that the computer no longer makes any abnormal noises.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	H99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): HDD - SSD Not Recognized / Not Mounting / Read–Write Issues

## Unlikely causes:


AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fans, heat sink, MagSafe board, memory, optical drive, power adapter, top case, trackpad


**Important:** Always ask whether user's data has been backed up prior to repair.

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Boots to gray screen.</li><li>Boots to blue screen.</li><li>Displays flashing folder with question mark or prohibitive symbol.</li><li>Cannot save documents.</li><li>Displays read/write error message(s).</li><li>Hangs when accessing or saving data.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and quoting accidental damage for Mac portables</a>.</p>	<p><b>Important:</b> Always ask if user's data has been backed up prior to repair.</p> <ol style="list-style-type: none"><li>Disconnect all peripherals and attempt to start up computer.</li><li>To restore default startup disk, reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.</li><li>Reset SMC using procedure listed for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li></ol>



## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Start up from known-good original system media or an up-to-date, bootable OS X volume.	Yes	Go to step 2.		
	Confirm that computer completes the startup process: chime > gray screen > Apple logo > spinning gear > login screen > desktop or installer screen.	No	Go to "Will Not Start Up" troubleshooting flow.		
	Does computer complete start up process?				
2.	Run AST Storage Diagnostic on the user's computer and examine the results of the test.	Yes	 <b>ESCALATION REQUIRED.</b> Contact TSPS for additional support or a multiple-part repair.  Click the Help button in the GSX toolbar. Select Troubleshooting > Technical Help with a Repair > Contact Apple.	H99	
	Do all internal drive tests pass in Storage Diagnostics?	No	Go to step 3.		
3.	Examine Storage Diagnostic results for presence of an internal drive.	PASS	Go to step 4.		
		FAIL	Go to step 16.		
	Did drive presence test PASS or FAIL?				



	Check	Result	Action	Code	Commodity
4.	Examine Storage Diagnostic results for SMART status.  Did SMART test PASS or FAIL?	PASS	Go to step 5.		
		FAIL	Go to step 9.		
5.	Examine Storage Diagnostic results for Short Random Multi-Block Read Test.  Did Short Random Multi-Block Read Test PASS or FAIL?	PASS	Go to step 6.		
		FAIL	Go to step 16.		
6.	Examine Storage Diagnostic results for File System Check.  Did File System Check PASS or FAIL?	PASS	Go to step 7.		
		FAIL	Go to step 10.		
7.	Examine Storage Diagnostic results for Bootable Volume Presence Check.  Did Bootable Volume Presence Check PASS or FAIL?	PASS	Go to step 8.		
		FAIL	Go to step 10.		
8.	Examine Storage Diagnostic results for Last OS Reinstall Check.  Did last OS Reinstall Check PASS or FAIL?	PASS	  <b>ESCALATION REQUIRED.</b>  Contact TSPS for additional support or a multiple-part repair.  Click the Help button in the GSX toolbar. Select Troubleshooting > Technical Help with a Repair > Contact Apple.	H99	
		FAIL	Go to step 10.		
9.	Identify the type of storage device affected: <ul style="list-style-type: none"><li>• Hard disk drive (HDD)</li><li>• Flash storage/solid-state drive (SSD)</li></ul> Is the affected device an HDD or SSD?	HDD	Replace the user's hard drive. Verify issue resolved.	H05	HDD
		SSD	Replace the user's flash storage/SSD. Verify issue resolved.	H05	SSD
10.	Restart while holding down Command-R keys to start up from recovery partition.  Does computer start up from recovery partition?	Yes	Go to step 12.		
		No	Go to step 11.		
11.	If OS X is present but not able to restart from the recovery partition, or the partition is missing, consult Apple Support article <a href="#">HT4848: About Recovery Disk Assistant</a> to restore the partition. Restart from the new recovery partition, holding down Command-R during restart.  Does computer start up from newly created recovery partition?	Yes	Go to step 12.		
		No	Go to step 16.		



	Check	Result	Action	Code	Commodity
12.	In Disk Utility, select the Partition tab, then click the Option button to verify that the partition table is correctly set to GUID. Try to repair the partition using Disk Utility.  Does Disk Utility successfully repair the partition?	Yes	Go to step 15.		
		No	Go to step 13.		
13.	Connect the computer to a network with Internet access.  Press Command-Option-R keys to start up the computer into the Internet recovery partition.  Open Disk Utility and refer to instructions in Apple Support article <a href="#">TS4482: Partition a problematic drive two times before recommending service or replacement</a> to re-partition the internal drive.  This will force a rewrite of the partition table.  Does Disk Utility successfully partition the drive without any errors?	Yes	Go to step 14.		
		No	Go to step 16.		
14.	Quit Disk Utility and restore OS X from the user's original OS X system software.  Does computer complete the start up process?	Yes	Go to step 15.		
		No	  <b>ESCALATION REQUIRED.</b>  Contact TSPS for additional support or a multiple-part repair.  Click the Help button in the GSX toolbar. Select Troubleshooting > Technical Help with a Repair > Contact Apple.	H99	

	Check	Result	Action	Code	Commodity
15.	Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.  Do all internal drive tests pass in Storage Diagnostic?	Yes	Issue resolved. Verify resolution.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	H99	
16.	Attempt to isolate which mass storage component is involved with this issue: <ul style="list-style-type: none"> <li>• Hard disk drive (HDD)</li> <li>• Solid state drive (SSD)</li> </ul> Is this an HDD or SSD issue?	SSD	Go to step 23.		
		HDD	Go to step 17.		
17.	Disconnect and inspect hard drive cable. Look for damage on logic board connector and cable.  Check for damaged or corroded cable connector and missing or bent pins on logic board connector.  Did you find damage to hard drive cable or logic board connectors?	Yes	Go to step 18.		
		No	Go to step 19.		
18.	Damage to multiple parts requires an escalation to Apple TSPS for repair approval.  Is damage limited to hard drive cable?	Yes	Replace hard drive cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	P99	

	Check	Result	Action	Code	Commodity
19.	Reconnect the hard drive cable to the logic board.	Yes	Issue resolved by reseating hard drive cable. Verify issue resolved.		
	Run AST storage Diagnostic on the user's computer again, and examine the results of the test.				
	Do all internal drive tests pass in Storage Diagnostics?	No	Go to step 20.		
20.	To troubleshoot this issue completely, the following known-good parts are required:	Yes	Go to step 21.		
	<ul style="list-style-type: none"> <li>• Hard drive</li> <li>• Hard drive cable</li> </ul>	No	Replace hard drive. Verify issue resolved.	H01	HDD
	Do you have immediate access to each of these known-good parts?				
21.	Substitute a known-good hard drive cable to test with user's hard drive.	Yes	Replace hard drive cable. Verify issue resolved.	X03	INTERNAL CABLE
	Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.	No	Go to step 22.		
	Do all internal drive tests pass in Storage Diagnostic?				
22.	Continue to use known-good hard drive cable and substitute a known-good hard drive.	Yes	Replace hard drive. Reinstall user's hard drive cable. Verify issue resolved.	H01	HDD
	Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.	No	Replace logic board. Reinstall user's hard drive cable. Verify issue resolved.	M19	MLB
	Do all internal drive tests pass in Storage Diagnostics?				
23.	Disconnect and inspect SSD card or flash storage. Look for damage on logic board connector and SSD card or flash storage.	Yes	Go to step 24.		
	Check for damaged or corroded card edge connectors and missing or bent pins on logic board connector.	No	Go to step 25.		
	Did you find damage to SSD card/flash storage or logic board connectors?				

	Check	Result	Action	Code	Commodity
24.	<p>Damage to multiple parts requires an escalation to Apple TSPS for repair approval.</p> <p>Is damage limited to SSD card or flash storage?</p>	Yes	Replace SSD card or flash storage. Verify issue resolved.	H01	SSD
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	P99	
25.	<p>Reconnect SSD to logic board.</p> <p>Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.</p> <p>Do all internal drive tests pass in Storage Diagnostic?</p>	Yes	Issue resolved by reseating SSD. Verify issue resolved.		
		No	Go to step 26.		
26.	<p>To troubleshoot this issue completely, a known-good SSD is required.</p> <p>Do you have immediate access to a known-good SSD?</p>	Yes	Go to step 27.		
		No	Replace SSD. Verify issue resolved.	H01	SSD
27.	<p>Substitute a known-good SSD.</p> <p>Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.</p> <p>Do all internal drive tests pass in Storage Diagnostic?</p>	Yes	Replace SSD. Verify issue resolved.	H01	SSD
		No	Replace logic board. Reinstall user's SSD. Verify issue resolved.	M19	MLB
28.	<p>Confirm that the computer can successfully start up from the internal drive.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	H99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): ODD Noisy

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan, hard drive, heat sink, logic board, MagSafe board, memory, power adapter, top case, trackpad

## Quick Check

Symptoms	Quick Check
<p>Listen closely in a quiet environment for the following:</p> <ul style="list-style-type: none"><li>Noise during start up</li><li>Noise during operation</li><li>Noise when drive is copying or saving data</li></ul> <p>Typical noises include sounds made during the following activities:</p> <ul style="list-style-type: none"><li>Waking computer from sleep</li><li>Burning a CD or DVD</li><li>Inserting a disc</li><li>Ejecting a disc</li><li>Importing (“ripping”) an audio CD in iTunes</li><li>Playing a DVD</li><li>Accessing an idle disc</li></ul> <p>Symptomatic noises:</p> <ul style="list-style-type: none"><li>Grinding</li><li>Loud, repeated clicking</li><li>Scraping sounds</li><li>Constantly seeking or cycling the eject mechanism with no disc inserted</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Verify that user's issue involves only abnormal sounds, as defined in symptoms. Note: Familiarize yourself with abnormal and normal optical drive noise.</li><li>Compare optical drive noise to a known-good equivalent computer. Use sound samples in Apple Support article <a href="#">HT1723: Mac notebooks with optical drives: Noises from the optical drive</a> to compare.</li><li>Verify noise issue does not involve waking the computer. When starting up or waking from sleep, the optical drive may make unfamiliar noises. Refer to Apple Support article <a href="#">TS2224: Apple Portables: Noise when powering on or waking from sleep is normal</a>.</li><li>Try user's optical disc in a known-good drive to rule out a media issue. Check that disc size and shape are within specification in Apple Support article <a href="#">HT2801: Troubleshooting the slot load optical disc drive</a>.</li><li>Try known-good discs in user's optical drive. Check that media is free to spin without scraping edge or surface of media.</li><li>Check for and apply the latest software and firmware updates.</li><li>Verify if noise occurs without media in the optical drive. If so, check for other source of noise, such as hard drive or fan.</li><li>Verify if noise when seeking or cycling is excessive. Seek noise should subside once disc is mounted.</li><li>Verify if disc spin noise is excessive. Disc spin should cease thirty seconds after mounting data disc in the Finder.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Verify if optical drive is constantly seeking or cycling the eject mechanism with no optical disc inserted. Optical drive should perform only one reset sequence and then rest idly, ready for media.	Yes	Replace optical drive. Verify issue resolved.	J04	OPTICAL
	Does optical drive spin, seek, and/or reset continuously without an optical disc inserted?	No	Go to step 2.		
2.	Insert a known-good disc, then eject disc while listening carefully to optical drive during disc handling. Eject noise should consist of a pop as the disc is released from the motor hub, then a gear sound as the motor pushes the disc out of the slot. Repeat test several times.	Yes	Replace optical drive. Verify issue resolved.	J02	OPTICAL
	Is disc eject noise abnormal and excessive over multiple trials?	No	Go to step 3.		
3.	Remove optical drive. Inspect optical drive slot and remove any foreign material or obstructions. Reinstall optical drive, ensuring that brackets are correctly mounted on top case. Retest.	Yes	Go to step 4.		
	Is optical drive still noisy after removing obstructions and reseating?	No	Issue resolved after cleaning and mounting drive properly. Verify resolution.		
4.	Disconnect optical drive and retest for computer noise.	Yes	Go to step 5.		
	Has noise been eliminated?	No	Go to "Noise / Hum / Vibration" troubleshooting flow.		
5.	To troubleshoot this issue completely, a known-good optical drive is required.	Yes	Go to step 6.		
	Do you have immediate access to a known-good optical drive?	No	Replace optical drive. Verify issue resolved.	J04	OPTICAL
6.	Substitute a known-good optical drive and retest.	Yes	Replace optical drive. Verify issue resolved.	J04	OPTICAL
	Has the noise been eliminated?	No	Go to "Noise / Hum / Vibration" troubleshooting flow.		
7.	Verify that the computer does not make any abnormal noises.	Yes	Issue resolved.		
	Is the issue resolved?	No	Go to "Noise / Hum / Vibration" troubleshooting flow.		

# MacBook Pro (13-inch, 15-inch, Mid 2012): ODD Not Recognized

## Unlikely causes:


AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan(s), hard drive, heat sink, MagSafe board, memory, power adapter, top case, trackpad

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Discs cannot be inserted.</li><li>Discs can be inserted, but are rejected immediately.</li><li>Discs can be inserted, but are rejected after drive has spun up for some seconds.</li><li>Discs can be inserted and ejected, but do not appear in the Finder.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check Finder Preferences &gt; General and make sure “CDs, DVDs, and iPods” is checked under “Show these items on the desktop.”</li><li>Check for and apply the latest software and firmware updates.</li><li>Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.</li><li>Reset the SMC using the procedure listed for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check Mac Resource Inspector (MRI) results or System Information (System Profiler in Snow Leopard) > Hardware > Serial-ATA section to verify the presence of the optical drive.  Does optical drive appear in MRI results or in System Information?	Yes	Go to step 2.		
		No	Go to step 3.		
2.	Check to see if the optical drive properly mounts then reads known-good CD and DVD media. If only one type of media is recognized, there may be a laser issue.  Can optical drive read both media types?	Yes	Issue resolved. Verify resolution.		
		No	Go to “Mass Storage: ODD Read-Write or Performance Issues” troubleshooting flow.		
3.	Disconnect the optical drive flex cable from the logic board. Inspect the cable and its connector for damage.  Is cable or connector damaged?	Yes	Replace optical drive flex cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 4.		

	Check	Result	Action	Code	Commodity
4.	<p>Closely inspect the optical drive flex cable for the presence of a foam pad over the connector. This pad is designed to keep the flex cable connector tightly seated on the logic board connector.</p>  <p>Is a foam pad present?</p>	Yes	Go to step 5.		
		No	Replace optical drive flex cable. Verify issue resolved.	X03	INTERNAL CABLE
5.	<p>With the optical drive flex cable still disconnected, inspect the connector port on the logic board.</p> <p>Is logic board damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M19	MLB
		No	Go to step 6.		
6.	<p>Reconnect the optical drive flex cable to the logic board connector, seating the cable connector firmly. Check System Information &gt; Hardware &gt; Serial-ATA section to see if the optical drive is detected.</p> <p>Does optical drive appear in System Information?</p>	Yes	Issue resolved by reseating the cable. Verify resolution.		
		No	Go to step 7.		
7.	<p>To troubleshoot this issue completely, the following known-good parts are required:</p> <ul style="list-style-type: none"> <li>Optical drive</li> <li>Optical drive flex cable</li> </ul> <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 8.		
		No	Replace optical drive. Verify issue resolved.	J09	OPTICAL
8.	<p>Substitute a known-good optical drive flex cable and connect it to user's optical drive. Check System Information &gt; Hardware &gt; Serial-ATA section to see if the optical drive is detected.</p> <p>Does optical drive appear in System Information?</p>	Yes	Replace optical drive flex cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 9.		
9.	<p>Continue to use the known-good optical drive flex cable. Substitute a known-good optical drive. Check System Information &gt; Hardware &gt; Serial-ATA section to see if the optical drive is detected.</p> <p>Does optical drive appear in System Information?</p>	Yes	Replace optical drive. Reinstall user's optical drive flex cable. Verify issue resolved.	J09	OPTICAL
		No	Replace logic board. Reinstall user's optical drive and flex cable. Verify issue resolved.	M19	MLB



	Check	Result	Action	Code	Commodity
10.	Insert, mount, and eject both a known-good CD and DVD.  Is the issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	J99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): ODD Read-Write or Performance Issues

## Unlikely causes:

AirPort / Bluetooth card(s), battery, bottom case, display clamshell, fan(s), Hard drive, heat sink, MagSafe board, memory, power adapter, top case, trackpad


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Errors when writing to optical media</li><li>Errors when reading from optical media</li><li>Hangs when accessing or writing data</li><li>Read or write speeds slower than expected</li></ul> <p><b>NOTE:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Quit applications and restart computer to isolate possible software issues.</li><li>Check for and apply the latest software and firmware updates.</li><li>Start up using known-good original system media or an up-to-date, bootable OS X volume.</li><li>Test user's optical media in an identical known-good optical drive in an equivalent computer.</li><li>Verify issue with known-good optical media.</li><li>For disc burning issues, test with known-good, high-performance optical media in another computer and optical drive of the same type.</li><li>Go to System Information (System Profiler in Snow Leopard) &gt; Hardware &gt; Disc Burning to compare actual disc burning specifications to user expectation.</li><li>See Apple Support articles <a href="#">HT2543: About optical disc drive burning and write speeds</a> and <a href="#">HT2882: Factors that affect writing to or reading from optical media</a> to learn more about disc burning and how performance is affected by write speeds, media types, software and more.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Insert media into optical drive and listen for scraping/scratching noises as disc spins up. Eject disc and examine its surface and edges for scrapes or scratches. Verify that the disc can spin without optical drive scraping the edge or surface of the media.	Yes	Go to step 2.		
		No	Replace optical drive. Verify issue resolved.	J03	OPTICAL
	Does media spin freely in the drive?				
2.	Verify that the optical drive can properly read known-good CDs.	Yes	Go to step 3.		
		No	Go to step 4.		
	Can optical drive read CDs?				
3.	Verify that the optical drive can properly read known-good DVDs.	Yes	Go to step 5.		
		No	Go to step 4.		
	Can optical drive read DVDs?				
4.	Check Mac Resource Inspector (MRI) results or System Information > Hardware > Serial-ATA to verify the presence of the optical drive.	Yes	Go to step 6.		
		No	Go to step 9.		
	Does optical drive appear in MRI results or in System Information?				

	Check	Result	Action	Code	Commodity
5.	Burn test data to CD and DVD media compatible with this optical drive. Verify that the burned media is recognized and readable by the drive.  Can optical drive read its own burned media?	Yes	Go to step 7.		
		No	Replace optical drive. Verify issue resolved.	J03	OPTICAL
6.	Remove optical drive, and use compressed air to remove dust, debris or other foreign materials.  If a disc is stuck in the drive, refer to Apple Support article <a href="#">RP1067: Removing a stuck disc from a slot-load optical drive</a> .  Reinstall optical drive, firmly mount optical drive brackets onto top case.  Verify read/write functionality.  Can optical drive read all media types?	Yes	Go to step 5.		
		No	Replace optical drive. Verify issue resolved.	J03	OPTICAL
7.	To troubleshoot this issue completely, you will need an identical, known-good computer model with which to compare optical disc read and burn times.  Do you have an identical, known-good computer model available?	Yes	Go to step 8.		
		No	Read/Write Performance issue cannot be duplicated. Return computer to user.		
8.	Using the same media type and brand, compare read and burn times with the optical drive in the known-good computer model.  Are read or burn times significantly longer than the known-good drive?	Yes	Replace optical drive. Verify issue resolved.	J07	OPTICAL
		No	Read/Write Performance issue cannot be duplicated. Return computer to user.		
9.	Disconnect optical drive flex cable from logic board. Inspect cable and its connector for damage.  Is cable or connector damaged?	Yes	Replace optical drive flex cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 10.		
10.	Closely inspect optical drive flex cable for presence of foam pad over connector. This pad is designed to keep the flex cable connector tightly seated on the logic board connector.  Is the foam pad present?	Yes	Go to step 11.		
		No	Replace optical drive flex cable. Verify issue resolved.	X03	INTERNAL CABLE
11.	With optical drive flex cable still disconnected, inspect connector port on logic board.  Is logic board damaged?	Yes	Replace logic board. Verify issue resolved.	M19	MLB
		No	Go to step 12.		
12.	Reconnect optical drive flex cable to logic board connector, seat cable connector firmly. Check System Information > Hardware > Serial-ATA section to see if optical drive is detected.  Does optical drive appear in System Information?	Yes	Issue resolved by reseating optical drive flex cable. Verify resolution.		
		No	Go to step 13.		

	Check	Result	Action	Code	Commodity
13.	<p>To troubleshoot this issue completely, the following known-good parts are required.</p> <ul style="list-style-type: none"> <li>Optical drive</li> <li>Optical drive flex cable</li> </ul> <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 14		
		No	Replace optical drive. Verify issue resolved.	J09	OPTICAL
14.	<p>Substitute a known-good optical drive flex cable, and connect it to user's optical drive. Check System Information &gt; Hardware &gt; Serial-ATA to see if optical drive is detected.</p> <p>Does the optical drive appear in System Information?</p>	Yes	Replace optical drive flex cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 15.		
15.	<p>Continue to use known-good optical drive flex cable. Substitute a known-good optical drive. Check System Information &gt; Hardware &gt; Serial-ATA to see if optical drive is detected.</p> <p>Does the optical drive appear in System Information?</p>	Yes	Replace optical drive. Reinstall user's optical drive flex cable. Verify issue resolved.	J09	OPTICAL
		No	Replace logic board. Reinstall user's optical drive and flex cable. Verify issue resolved.	M19	MLB
16.	<p>Test all optical drive functions and drive performance to verify a successful repair.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): ODD Rejects or Does Not Accept Media

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan, hard drive, heat sink, logic board, MagSafe board, memory, power adapter, speakers, trackpad


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Cannot insert a disc into the drive.</li><li>Cannot eject a disc from the drive.</li><li>Drive ejects discs immediately after insertion.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Restart the computer and hold down the mouse button or keyboard Eject key to cycle the optical drive.</li><li>Inspect the optical drive slot for obstructions.</li><li>Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check Mac Resource Inspector (MRI) results or check System Information (System Profiler in Snow Leopard) > Hardware > Serial-ATA section to verify the presence of the optical drive.  Does optical drive appear in MRI results or in System Information?	Yes	Go to step 2.		
		No	Go to “ODD Not Recognized” troubleshooting flow.		
2.	Determine if a disc is stuck in the optical drive.  Is a disc stuck in the drive?	Yes	Go to step 3.		
		No	Go to step 4.		
3.	Refer to Apple Support article <a href="#">RP1067: Removing a stuck disc from a slot-load optical drive</a> , and remove the stuck disc. Retest optical drive by inserting, mounting and ejecting a known-good optical disc.  Is optical drive function fully restored?	Yes	Issue resolved by removing stuck disc.		
		No	Replace optical drive. Verify issue resolved.	J02	OPTICAL
4.	Inspect the optical drive slot bezel in the top case for damage. Check the clearance to verify if a known-good disc can fit through the top case drive opening.  Is clearance in top case drive slot sufficient for disc insertion?	Yes	Go to step 8.		
		No	Go to step 5.		
5.	Inspect the slot bezel in the top case for dents, scratches, or other indications of impact or abuse.  Is insufficient clearance due to accidental damage?	Yes	Go to step 6.		
		No	Go to step 7.		

	Check	Result	Action	Code	Commodity
6.	Using Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a> as a guide, inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options, and refer to <a href="#">OP18: SERVICE: Accidental Damage Repair Pricing for Mail-In Notebooks and Displays</a> for pricing.	Yes	Replace top case. Verify issue resolved.	X13	KEYBOARD
		No	Using proper positioning, return computer to user.		
	Does user want to proceed with out-of-warranty repair?				
7.	Make sure the optical drive is mounted onto the top case correctly and is properly aligned with the optical drive slot opening. If necessary, remove the mounting screws and reseal the flex cable to align the optical drive with the disc slot.	Yes	Issue resolved. Optical drive alignment realigned the disc inject function.		
		No	Replace top case. Verify issue resolved.	X13	KEYBOARD
	Is clearance in optical drive slot sufficient for disc insertion after alignment check?				
8.	Inspect the slot on the optical drive assembly for proper disc clearance.	Yes	Go to step 14.		
		No	Go to step 9.		
	Is clearance in optical drive slot itself sufficient for disc insertion?				
9.	When a CD or DVD pops off the spindle inside an optical drive (usually due to impact to the computer) and remains in the drive mechanism, the loose disc prevents the slot from being able to open fully, creating a “closed condition.” Inspect the slot in the optical drive to determine if it is “closed” (not accepting discs). If the disc slot is closed, inspect the computer, especially the slot enclosure, for evidence of drop damage.	Yes	Go to step 10.		
		No	Go to step 11.		
	Is disc slot access closed due to accidental damage?				
10.	Using Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a> as a guide, inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options, and refer to <a href="#">OP18: SERVICE: Accidental Damage Repair Pricing for Mail-In Notebooks and Displays</a> for pricing.	Yes	Replace optical drive. Verify issue resolved.	J02	OPTICAL
		No	Issue resolved. Using proper positioning, return the computer to the user.		
	Does user want to proceed with out-of-warranty repair?				
11.	Inspect the slot in the optical drive to determine if it is “closed” (not accepting discs) because of a stuck disc.	Yes	Go to step 13.		
		No	Go to step 12.		
	Is a disc stuck in the drive?				

	Check	Result	Action	Code	Commodity
12.	Make sure the optical drive is mounted onto the top case correctly and is properly aligned with the optical drive slot opening. If necessary, remove the mounting screws and reseal the flex cable to align the optical drive with the disc slot.	Yes	Go to step 14.		
		No	Replace optical drive. Verify issue resolved.	J01	OPTICAL
	Is clearance in optical drive slot sufficient for disc insertion after alignment check?				
13.	Refer to Apple Support article <a href="#">RP1067: Removing a stuck disc from a slot-load optical drive</a> and remove the stuck disc. Retest optical drive by inserting, mounting, and ejecting a known-good optical disc.	Yes	Issue resolved by removing the stuck disc.		
		No	Replace optical drive. Verify issue resolved.	J02	OPTICAL
	Is optical drive function fully restored?				
14.	Attempt to insert a known-good disc into the optical drive.	Yes	Replace optical drive. Verify issue resolved.	J01	OPTICAL
		No	Go to step 15.		
	Does disc immediately auto-eject?				
15.	After insertion, verify that the disc volume mounts in the Finder.	Yes	Go to step 16.		
		No	Go to “ODD Read-Write or Performance Issues” troubleshooting flow.		
	Does disc volume mount?				
16.	Eject the disc by dragging the disc icon to Trash or selecting the disc icon and pressing Command-E.	Yes	Go to step 17.		
		No	Replace optical drive. See Apple Support article <a href="#">RP1067: Removing a stuck disc from a slot-load optical drive</a> to remove a stuck disc. Verify issue resolved.	J02	OPTICAL
	Does disc eject properly?				
17.	Insert, mount, and eject a known-good optical disc.	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	J99	
	Is the issue resolved?				

# MacBook Pro (13-inch, 15-inch, Mid 2012): SD Memory Card Cannot Be Inserted Into Slot

## Unlikely causes:


AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan(s), hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, trackpad

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Cannot insert SD card into slot</li><li>• Can insert SD card only part way into slot</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>1. Verify user's SD card is not warped or damaged, and that metal contacts are clean, intact, and corrosion-free.</li><li>2. Verify SD card is correct size. Card dimensions should be 32mm x 24mm x 2.1mm.  <b>Note:</b> Cards thicker than 2.1mm are too thick and may damage card slot if inserted. Thinner cards such as MultiMediaCards (MMC) are acceptable. Refer to Apple Support article <a href="#">HT3553: About the SD and SDXC card slot</a> for further information.</li><li>3. Verify computer's SD card slot is not obstructed. Use a flashlight to look inside slot. Verify nothing is already inserted. Carefully remove any obstruction from slot. Attempt to insert SD card.</li></ol>

## Deep Dive



	Check	Result	Action	Code	Commodity
1.	<p>Insert known-good, formatted SD card into user's computer. Verify that it seats correctly.</p> <p>Does known-good SD card seat correctly when inserted?</p>	Yes	Issue resolved. Defective or incompatible SD card. Direct user to contact SD card vendor for support. Refer them to Apple Support article <a href="#">HT3553: About the SD and SDXC card slot</a> for further information.		
		No	Go to step 2.		
2.	<p>Loosen all logic board screws and insert known-good SD card.</p> <p>Can you now insert known-good SD card correctly?</p>	Yes	Go to step 3.		
		No	Go to step 4.		
3.	<p>Insert a mini-jack plug into headphone port and an SD card into card slot. With plug and card serving as alignment guides, tighten logic board screws.</p> <p>Remove headphone jack and SD card; then reinsert SD card.</p> <p>Can you now insert and remove known-good SD card correctly?</p>	Yes	Issue resolved with logic board alignment. Verify resolution.		
		No	Go to step 4.		
4.	<p>Remove logic board and inspect top case card slot for warping, damage, or obstructions. Remove any obstruction and retest.</p> <p>Can you now insert known-good SD card correctly?</p>	Yes	Go to step 5.		
		No	Replace top case. Verify issue resolved.	X13	KEYBOARD
5.	<p>Inspect logic board card slot for damage, obstructions, or debris. Remove any obstruction and use compressed air to clear out dust and debris. Reinstall logic board and retest.</p> <p>Can you now insert known-good SD card correctly?</p>	Yes	Issue resolved by cleaning logic board card slot. Verify resolution.		
		No	Replace logic board. Verify issue resolved.	M27	MLB
6.	<p>Verify known-good SD memory card can be fully inserted into and ejected from slot and that it seats correctly.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in the GSX Toolbar; then select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): SD Memory Card Not Recognized

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan(s), hard drive, heat sink, MagSafe board, memory, optical drive, power adapter, speakers, trackpad


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>SD card does not appear on desktop or in System Information (System Profiler in Snow Leopard)</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Verify user's SD card is unlocked.</li><li>Verify SD card is not warped or damaged and metal contacts are clean, intact, and corrosion free.</li><li>Verify computer's SD card slot is not damaged or obstructed. Use a flashlight to look inside slot to make sure nothing is already inserted. Carefully remove any obstruction from slot. Try to insert SD card.</li><li>Verify SD card is correct size. Card dimensions should be 32mm x 24mm x 2.1mm. Note: Cards thicker than 2.1mm are too thick and may damage card slot if inserted. Thinner cards such as MultiMediaCards (MMC) are acceptable. Refer to Apple Support article HT3553: About the SD and SDXC card slot for further specifications.</li><li>Consult Apple Support article <a href="#">HT3553: About the SD and SDXC card slot</a> and check for compatible SD card type and format.<ul style="list-style-type: none"><li>SD card slot can accommodate cards that are Standard SD (Secure Digital) 4 MB to 2 GB, SDHC (Secure Digital High Capacity) 4 GB to 32 GB, and SDXC (Secure Digital Extended Capacity) 4GB to 2 TB, and MMC (MultiMediaCard) formats.</li><li>SDIO (Secure Digital Input Output) cards fit into and shouldn't damage card slot, but they are not supported.</li><li>MiniSD and MicroSD cards require adapters.</li><li>ExFAT formatted cards require at least OS X 10.6.5.</li></ul></li><li>For a more specific SD card type or format (i.e., wireless-enabled SD card or other SD card) make sure correct driver is installed. OS X supports only standard SD memory cards. Other cards may require specific driver software.</li><li>Make sure Finder Preferences &gt; General is set to show External Disks.</li><li>Check for and apply latest software and firmware updates.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Insert a known-good, formatted SD card into user's computer. Verify that it seats correctly.	Yes	Go to step 2.		
	Does known-good SD card seat correctly when inserted?	No	Go to "SD Memory Card Cannot Be Inserted Into Slot" troubleshooting flow.		

	Check	Result	Action	Code	Commodity
2.	Verify that a known-good SD card appears in Disk Utility and mounts in Finder. Verify computer can read data from and write data to SD card.  Can computer read from and write to known-good SD card?	Yes	Go to step 4.		
		No	Go to step 3.		
3.	Start up user's computer with known-good original system media or an up-to-date, bootable OS X volume. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.  Verify that known-good SD card appears and mounts in Disk Utility and Finder.  Can computer read from and write to known-good SD card?	Yes	Repair permissions and directory using Disk Utility. If issue persists, restore OS X (using correct system build). Retest to verify resolution. Verify OS version is at least 10.6.5 or that user has necessary driver software.		
		No	Replace logic board. Verify issue resolved.	M27	MLB
4.	Insert user's SD card into user's computer. Verify that it seats correctly.  Does user's SD card seat correctly when inserted?	Yes	Go to step 5.		
		No	Defective or incompatible SD card. Direct user to contact SD card manufacturer for support. Refer user to Apple Support article <a href="#">HT3553: About the SD and SDXC card slot</a> for further information.		
5.	Verify that card appears in left column of Disk Utility. If card does not appear, eject and reinsert card. If inserted too slowly, card may not appear.  Does SD card appear in Disk Utility?	Yes	Go to step 7.		
		No	Go to step 6.		
6.	Insert user's SD card into a known-good computer. Verify that computer can read data from and write data to SD card.  Can a known-good computer read from and write to user's SD card?	Yes	Repair permissions and directory using Disk Utility. If issue persists, restore OS X (using correct system build). Retest to verify resolution. Verify OS version is at least 10.6.5 or that user has necessary driver software.		
		No	Defective or incompatible SD card. Direct user to contact SD card manufacturer for support. Refer user to Apple Support article <a href="#">HT3553: About the SD and SDXC card slot</a> for further information.		
7.	Verify that user's SD card volume appears in Disk Utility and mounts in Finder.  Does card volume mount in Finder or Disk Utility?	Yes	Go to step 9.		
		No	Go to step 8.		

	Check	Result	Action	Code	Commodity
8.	Format user's SD Card as OS X Extended Journaled with a GUID partition scheme.  <b>Important:</b> Make sure user has a valid backup. If formatting is successful, retest SD card by writing data to and retrieving data from SD card.  Were you able to reformat, then write to and read from SD card successfully?	Yes	Issue resolved by reformatting SD card. Verify resolution.		
		No	Defective or incompatible SD card. Direct user to contact SD card manufacturer for support. Refer user to Apple Support article <a href="#">HT3553: About the SD and SDXC card slot</a> for further information.		
9.	Test user's SD card by writing data to and retrieving data from SD card.  Were you able to write to and read from user's card successfully?	Yes	Verify issue resolved.  If issue persists, contact TSPS for additional support. Click Help button in GSX Toolbar > Technical Help with a Repair > Contact Apple.	M99	
		No	Defective or incompatible SD card. Direct user to contact SD card manufacturer for support. Refer user to Apple Support article <a href="#">HT3553: About the SD and SDXC card slot</a> for further information.		
10.	Verify that user's computer can successfully read from and write to a known-good SD card.  Is the issue resolved?	Yes	Issue resolved.		
		No	  <b>ESCALATION REQUIRED.</b>  Contact TSPS for additional support or a multiple-part repair. Click Help button in GSX Toolbar > Technical Help with a Repair > Contact Apple.	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Burnt Smell / Odor


## Unlikely causes:



Enclosure




## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Computer or power adapter emits a burnt, smoky or other unusual odor.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>1. Disconnect power adapter and peripherals to eliminate external devices as source of odor.</li><li>2. Odors can be related to how new the product is. Refer to Apple Support article <a href="#">HT4921: New Equipment: Odors May Be Present Short-Term</a>.</li><li>3. Determine if this is a safety issue. Refer to Apple Support article <a href="#">OP44: SERVICE: Handling Potential Product Safety Issues</a>.</li><li>4. Inspect enclosure and components for obvious signs of burning or smoky residue. Check rear vents, keyboard, slots, ports, power adapter, MagSafe connector and cable. Refer to Apple Support article <a href="#">TS4039: Smoke emitted may be from failed component</a>.</li><li>5. Inspect air intake vents and outlets for any obstructions. Make sure air can flow freely into and out of the enclosure.</li><li>6. Clean enclosure to eliminate odors resulting from external contamination. Refer to Apple Support article <a href="#">HT3226: How to clean Apple products</a>. Explain the cause to user.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Closely inspect computer for a possible safety issue.  Have you identified a safety issue?	Yes	 <b>ESCALATION REQUIRED.</b>  Contact TSPS for safety-related issues. Click the Help button in the GSX toolbar > Technical Help with a Repair > Contact Apple. Refer to Apple Support article <a href="#">OP44: SERVICE: Handling Potential Product Safety Issues</a> .	T99	
		No	Go to step 2.		
2.	Odor can be related to external contamination. Inspect computer exterior for contamination or lack of cleanliness.  Can you determine that odor is caused by external contamination?	Yes	Go to step 3.		
		No	Go to step 4.		

	Check	Result	Action	Code	Commodity
3.	<p>Thoroughly clean enclosure and all external surfaces. Refer to Apple Support article <a href="#">HT3226: How to clean Apple products</a>. Explain cause to user.</p> <p>Does user agree that odor is due to external contamination?</p>	Yes	Issue resolved. Verify resolution.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
4.	<p>Odors can be related to how new the product is. Refer to Apple Support article <a href="#">HT4921: New Equipment: Odors May Be Present Short-Term</a>.</p> <p>Can you determine that the odor is due to newness?</p>	Yes	Go to step 5.		
		No	Go to step 6.		
5.	<p>Explain to user that new computers can sometimes emit an odor similar to odors generated from new carpeting or a new car. In most cases, the odor dissipates after a brief period. Refer user to Apple Support article <a href="#">HT4921: New Equipment: Odors May Be Present Short-Term</a>.</p> <p>Does user agree the odor is related to the computer's newness?</p>	Yes	Issue resolved. Verify resolution.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
6.	<p>Remove bottom case and disconnect battery cable from logic board.</p> <p>Closely inspect internal components and enclosure for indications of physical damage or contamination.</p> <p>Can you identify signs of internal damage or contamination?</p>	Yes	Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a> .		
		No	Go to step 7.		
7.	<p>Verify if any liquid contact indicators (LCIs) are pink or red, confirming liquid damage.</p> <p>Do LCIs reveal liquid damage?</p>	Yes	Refer to Apple Support article <a href="#">HT3400: About Liquid Contact Indicators on portables and desktop computers</a>		
		No	Go to step 8.		

	Check	Result	Action	Code	Commodity
8.	<p>Closely inspect internal hardware and enclosure for other possible causes of odor, such as bulging or vented capacitors; and visible residue and/or burn marks on the enclosure, logic board, or other components.</p> <p>Have you identified a component failure as the source of the odor?</p>	Yes	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
		No	Go to step 9.		
9.	<p>Run computer for several hours and monitor for issue/odor. Test with Apple Service Diagnostic (ASD), both ASD EFI and ASD OSX.</p> <p>If no functional failure is detected, use correct positioning to explain to the user that the odor is related to external contamination or newness of the computer.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved. Verify resolution.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
10.	<p>Run computer for several hours and monitor for issue/odor. Test with Apple Service Diagnostic (ASD), both ASD EFI and ASD OSX.</p> <p>If no functional failure is detected, use correct positioning to explain to the user that the odor is related to external contamination or newness of the computer.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Computer Runs Hot

## Unlikely causes:

AirPort/Bluetooth card(s), bottom case, power adapter, speakers, top case


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Computer feels unusually warm.</li><li>• Fan is not operating.</li><li>• Fan is not functioning to its full capacity.</li><li>• Fan runs constantly at high speeds.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<p>Run Mac Resource Inspector (MRI) to verify correct operation of sensors and fan(s).</p> <p>Check for and apply the latest software and firmware updates.</p> <p>Verify the temperature issue by resting computer on a hard, flat surface. <b>Note:</b> Use this opportunity to educate user about inappropriate working surfaces that may cause a computer to overheat. Refer to Apple Support article <a href="#">HT1778: Apple Portables: Operating Temperature</a>.</p> <p>Inspect fan performance during operation to confirm fan is spinning. Check that vents are not blocked, and if necessary, use compressed air to remove dust or debris from rear fan exhaust.</p> <p>Compare computer's operating temperature to a known-good, similarly configured computer.</p> <p>Check for runaway applications. Refer to Apple Support article <a href="#">TS1473: Runaway applications can shorten battery runtime</a>. Follow instructions to halt any processes that are using excessive system resources.</p> <p>Applications and system processes that are processor-intensive / graphics-intensive may cause bottom case to feel warm. Use Activity Monitor to identify these types of programs and explain issue to user.</p> <p>Reset SMC using the procedure listed for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</p> <p>Check computer's internal hard drive to confirm it is an Apple-installed part. Compare hard drive information in System Information (System Profiler in Snow Leopard) to the Apple Hard Drives Matrix in Apple Support article <a href="#">SM155: Hard Drives Matrix</a> to determine if user's installed drive is one of the OEM drives available for this computer configuration. <b>Note:</b> Third-party hard drives outside this product's specifications, and without correct firmware, may cause computer to run hot. In such cases, inform user that computer has been modified from its original, supported configuration, and such a repair would not be covered under Apple warranty.</p>

## Deep Dive


	Check	Result	Action	Code	Commodity
1.	Run MRI to check fan operation and current status of thermal sensors. MRI will report a failure if a fan isn't rotating or a sensor is undetected or exceeding thermal values.	Yes	Go to step 2.		
		No	Go to step 9.		
	Does computer pass all MRI checks?				



	Check	Result	Action	Code	Commodity
2.	Restart computer from Apple Service Toolkit (AST) server by pressing N key during startup. Check for presence of the extended version of Cooling Service Diagnostic (CSD).  Is CSD Extended available for this computer model?	Yes	Go to step 3.		
		No	Go to step 25.		
3.	Use extended version of CSD to verify proper function of the following subsystems:  <ul style="list-style-type: none"> <li>• SMC</li> <li>• Fans</li> <li>• Thermal sensors</li> <li>• CPU heat sink thermal interface</li> </ul> Refer to Apple Support article <a href="#">TP593: Cooling System Diagnostic (CSD): Standard and Extended</a> .  Does computer pass all CSD checks?	Yes	Computer passed all CSD checks. Verify operation and refer customer to Apple Support article <a href="#">HT1778: Apple Portables: Operating Temperature</a> .		
		No	Go to step 4.		
4.	Remove three fan screws and extract fan to reveal inner side of heat sink. Use an ESD-safe vacuum to remove dust or debris from inner side of heat sink fin stack.  Reinstall fan and reseal fan cable connection to logic board. Repeat operation with second fan, if present. Retest using CSD.   Does computer pass all CSD checks?	Yes	Issue resolved by cleaning airflow. Verify resolution.		
		No	Go to step 5.		
5.	To troubleshoot this issue completely, a known-good fan (or set of fans) is required. Some models have a left and right fan.  Do you have immediate access to known-good fan(s)?	Yes	Go to step 6.		
		No	Replace non-rotating or slower fan. Verify issue resolved.	X22	OTHER ELECTRIC
6.	Substitute a known-good fan or fan(s) and retest using MRI and CSD.  Does the known-good fan pass MRI checks and run-in tests?	Yes	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
		No	Go to step 7.		
7.	To troubleshoot this issue completely, a known-good logic board is required.  Do you have immediate access to a known-good logic board?	Yes	Go to step 8.		
		No	Replace logic board. Reinstall user's fan. Verify issue resolved.	M18	MLB

	Check	Result	Action	Code	Commodity
8.	Continue to use known-good fan. Substitute a known-good logic board using new thermal material with user's heat sink.	Yes	Replace logic board. Reinstall user's fan. Verify issue resolved.	M18	MLB
	Reinstall heat sink onto logic board, tighten heat sink screws with sufficient torque. If a thermal sensor is present on heat sink, make sure it is properly reconnected to logic board. Reassemble computer and retest with MRI.	No	Replace heat sink on user's logic board with new thermal material. Verify issue resolved.	X10	OTHER ELECTRIC
	Do both known-good fan and logic board pass MRI and run-in tests?				
9.	A disconnected fan will prevent proper cooling and cause thermal sensors to exceed expected values.	Yes	Go to step 10.		
		No	Go to step 15.		
	Does MRI report a fan motor test failure?				
10.	Turn off computer, remove bottom case. Disconnect and remove battery. Disconnect fan cable connector from logic board.	Yes	Go to step 11.		
	Inspect the logic board and fan cable connector pins for damage. Repeat operation with second fan, if present.	No	Go to step 12.		
	Did you find any damaged components?				
11.	Identify whether fan or logic board is damaged.	Fan	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
	Which part is damaged?	Logic Board	Replace logic board. Verify issue resolved.	M24	MLB
12.	Remove three fan screws and extract fan to reveal inner side of heat sink. Use an ESD-safe vacuum to remove dust or debris from inner side of heat sink fin stack.	Yes	Issue resolved by cleaning and reseating fan cable. Verify resolution.		
	Reinstall fan and reseat fan cable connection to logic board. Repeat operation with second fan, if present. Retest using MRI.	No	Go to step 13.		
	Does computer pass fan motor check?				
13.	To troubleshoot this issue completely, a known-good fan is required.	Yes	Go to step 14.		
	Do you have immediate access to a known-good fan?	No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
14.	Substitute a known-good fan, and retest using MRI.	Yes	Replace fan. Verify issue resolved.	X22	INTERNAL CABLE
	Does the known-good fan pass MRI fan motor check?	No	Reinstall user's fan and replace logic board. Verify issue resolved.	M18	MLB

	Check	Result	Action	Code	Commodity
15.	A disconnected, shorted, or failing sensor will lead the computer to preventively operate the fan(s) at higher speed(s).  Does MRI report a TXxx thermal sensor failure?	Yes	Go to step 16.		
		No/Other	Go to step 19.		
16.	Determine which specific thermal sensor tests failed in MRI and if error codes included <b>Ts0P</b> .  Did MRI report a trackpad thermal sensor (Ts0P) error?	Yes	Go to step 17.		
		No/Other	Go to step 20.		
17.	The clamshell camera cable includes the trackpad thermal sensor (Ts0P) and ambient light sensor (ALS) and share the same bus connection. A short in the camera cable could lead to an erroneous Ts0P failure. The trackpad flex cable is calibrated to the trackpad and must never be removed from the trackpad.  Shut down computer and wait 15 seconds before disconnecting camera cable from logic board. Run MRI again to test for Ts0P failure with trackpad connected to logic board.  <b>Note:</b> The ALS may fail the test as expected by its disconnection.  Does MRI report a trackpad thermal sensor (Ts0P) error?	Yes	Go to step 18.		
		No	Replace display clamshell. Verify issue resolved.	L14	LCD
18.	Reseat trackpad flex cable and retest with MRI.  Does MRI report a trackpad thermal sensor (Ts0P) error?	Yes	Replace trackpad. Verify issue resolved.	K12	OTHER ELECTRIC
		No	Issue resolved by reseating trackpad cable. Verify resolution.		
19.	Other voltage and current sensors are also tested by MRI. Any failure to read them or any unexpected value read will lead MRI to report a test failure.  Does MRI fail any VXxx or IXxx test?	Yes	Replace logic board. Verify issue resolved.	M23	MLB
		No/Other	Go to step 22.		
20.	Determine if error codes include Battery TS MAX ( <b>TB0T</b> ), Battery TS 1 ( <b>TB1T</b> ) and/or Battery TS 2 ( <b>TB2T</b> ).  Do MRI errors include Battery TS MAX, Battery TS 1 and/or Battery TS 2?	Yes	Replace battery. Verify issue resolved.	P19	BATTERY
		No/Other	Go to step 21.		
21.	Retest with MRI to verify any remaining thermal sensor errors.  Does MRI pass all checks?	Yes	The computer passed all MRI checks. Issue resolved. Verify resolution.		
		No	Go to step 22.		

	Check	Result	Action	Code	Commodity
22.	Remove logic board and heat sink, wipe away existing thermal material, and apply new material. Reinstall heat sink onto logic board, tightening heat sink screws with sufficient torque.	Yes	Issue resolved by reseating heat sink with new thermal material. Verify resolution.		
	If a thermal sensor is present on the heat sink, make sure it is properly reconnected to logic board. Reassemble computer and retest with MRI.	No	Go to step 23.		
	Does MRI pass all checks?				
23.	To troubleshoot this issue completely, a known-good heat sink is required.	Yes	Go to step 24.		
	Do you have immediate access to a known-good heat sink?	No	Replace heat sink and apply new thermal material. Verify issue resolved.	X10	OTHER ELECTRIC
24.	Install a known-good heat sink with new thermal material. Reinstall heat sink onto logic board, tighten heat sink screws with sufficient torque. If a thermal sensor is present on heat sink, make sure it is properly reconnected to logic board.	Yes	Replace heat sink and apply new thermal material. Verify issue resolved.	X10	OTHER ELECTRIC
	Reassemble computer and retest with MRI.	No	Replace logic board. Reinstall user's heat sink with new thermal material. Verify issue resolved.	M18	MLB
	Does MRI pass all checks?				
25.	Restart computer from Apple Service Diagnostics OS (ASD) bootable drive, choose loop and start tests.	Yes	Computer passed ASD. Verify operation and refer customer to Apple Support article <a href="#">HT1778: Apple Portables: Operating Temperature</a> .		
	Does computer pass ASD?	No	Go to step 4.		
26.		Yes	Issue resolved.		
	Verify that the computer no longer overheats during use.  Is the issue resolved?	No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Mechanical/Physical/Cosmetic Damage


## Unlikely causes:

Not relevant.

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Broken glass</li><li>• Broken hinge</li><li>• Stripped screw/head</li><li>• Stripped screw boss/threads</li><li>• Dented or scratched enclosure</li><li>• Cracked LCD</li><li>• Scorched or melted LCD</li><li>• LCD impact damage</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<p>Inspect computer and discuss nature of issue with user. Determine whether user wants to proceed with repair (despite possible accidental damage) or pursue other service options. Click "No" to proceed with further troubleshooting.</p>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Determine cause of damage or defects: user, technician, environment, accidental damage, or abuse.	Yes	 <b>ESCALATION REQUIRED.</b> Contact TSPS for assistance with Apple-related accidental damage.  Click Help button in GSX Toolbar > Technical Help with a Repair > Contact Apple.	X99	
	Is an Apple agent responsible for damage or defect on the computer?	No	Proceed with resolution or repair using proper positioning. Inform user that computer failures due to accidental damage are not covered by Apple's one-year limited warranty or AppleCare Protection Plan (APP). Refer to <a href="http://www.apple.com/legal/warranty">www.apple.com/legal/warranty</a> .	X99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Noise / Hum / Vibration

## Unlikely causes:

AirPort/Bluetooth card(s), battery, bottom case, display clamshell, heat sink, logic board, MagSafe board, memory, top case, trackpad


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Computer or power adapter emits noise or vibration.</li></ul> <p><b>NOTE:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Work with user to reproduce issue and isolate source of noise. Differentiate whether noise is coming from computer or power adapter.</li><li>If power adapter is source of noise, test with a known-good adapter. (A small amount of hum or vibration is normal for power adapters.)</li><li>If necessary, explain to user that some noises are normal. Refer to the following Apple Support articles:<ul style="list-style-type: none"><li><a href="#">TS2354: Apple Portables: Hard drives and noise</a></li><li><a href="#">TS2224: Apple Portables: Noise when powering on or waking from sleep is normal</a></li><li><a href="#">HT1723: Mac notebooks with optical drives: Noises from the optical drive</a></li></ul></li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Shut down the computer and let it cool off fully. Check for noise, hum or vibration during startup when computer is cold.  Does issue happen on or after a cold startup?	Yes	Go to step 2.		
		No	Go to step 7.		
2.	An unreadable thermal sensor can cause fan(s) to run excessively. Run Mac Resource Inspector (MRI) to check thermal sensors.  Does MRI report any thermal sensor failures?	Yes	Go to "Computer Runs Hot" troubleshooting flow.		
		No	Go to step 3.		
3.	Excessive fan operation may also occur if computer is unable to read fan speed. Check MRI results for fan (motor) sensor test results.  Does MRI report any fan (motor) failures?	Yes	Go to step 4.		
		No	Go to step 6.		
4.	To troubleshoot this issue completely, known-good fan(s) are required.  Do you have immediate access to known-good fan(s)?	Yes	Go to step 5.		
		No	Replace affected fan. Verify issue resolved.	X23	OTHER ELECTRIC
5.	Substitute known-good fan(s) and retest with MRI.  Do known-good fan(s) pass the fan (motor) test in MRI?	Yes	Replace affected fan. Verify issue resolved.	X22	OTHER ELECTRIC
		No	Reinstall user's fan(s). Replace logic board. Verify issue resolved.	M23	MLB

	Check	Result	Action	Code	Commodity
6.	Disconnect fan and briefly retest for noise, hum or vibration. Repeat with second fan (if present).  Has the noise been eliminated?	Yes	Replace affected fan. Verify issue resolved.	X23	OTHER ELECTRIC
		No	Go to step 7.		
7.	Remove media from optical drive and retest for noise. If noise was eliminated, insert known-good media and test once more for noise.  Is noise eliminated when no media and known-good media are used in optical drive?	Yes	Go to “ODD Noisy” troubleshooting flow.		
		No	Go to step 8.		
8.	Remove internal hard drive and start up computer from known-good original system media or an up-to-date, bootable OS X volume.  Has the noise been eliminated?	Yes	Go to “HDD Noisy” troubleshooting flow.		
		No	Go to step 9.		
9.	Substitute a known-good power adapter.  Has the noise been eliminated?	Yes	Replace power adapter. Verify issue resolved.	P04	ADAPTER
		No	Go to step 10.		
10.	Disconnect any peripheral devices, cards, or cables attached to the computer.  Has the noise been eliminated?	Yes	Issue resolved. Issue caused by ground loop induced by third-party devices. Advise user to connect all devices to a common power outlet or contact device manufacturer for support.		
		No	Go to step 11.		
11.	To troubleshoot this issue completely, known-good fan(s) are required.  Do you have immediate access to known-good fan(s)?	Yes	Go to step 12.		
		No	Go to step 13.		
12.	Substitute with known-good fan(s).  Has the noise been eliminated?	Yes	Replace affected fan. Verify issue resolved.	X23	OTHER ELECTRIC
		No	Go to step 14.		
13.	Disconnect fan and briefly retest for noise, hum or vibration. Repeat with second fan (if present).  Has the noise been eliminated?	Yes	Replace affected fan. Verify issue resolved.	X23	OTHER ELECTRIC
		No	Go to step 14.		

	Check	Result	Action	Code	Commodity
14.	<p>Noise may be related to interference from other electrical devices operating near computer or plugged into the same power outlet. See if noise is eliminated when computer runs in a different location on a different power outlet.</p> <p>Has the noise been eliminated?</p>	Yes	Issue resolved. Verify resolution.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	



# MacBook Pro (13-inch, 15-inch, Mid 2012): Power Button Stuck


## Unlikely causes:

AirPort/Bluetooth card(s), bottom case, display clamshell, fan, hard drive, heat sink, logic board, MagSafe board, memory, optical drive, speakers

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Computer will not start up.</li><li>• Long tone during startup.</li><li>• Computer repeatedly starts up on its own.</li><li>• Computer shuts down during startup process.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>1. Verify whether issue occurs when computer is running on battery alone.</li><li>2. If issue occurs on battery power alone, check battery health using Mac Resource Inspector (MRI).</li><li>3. Reset the SMC using the procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li></ol> <p>Note: If bottom case is removed, you may alternately perform a manual reset by disconnecting the battery and power adapter for 30 seconds. Plug in the power adapter and retest.</p>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	If the SMC reset (Quick Checks) didn't resolve the issue, perform a manual reset by disconnecting the battery and power adapter for 30 seconds. Plug in the power adapter and retest.  Does power button function normally?	Yes	Issue resolved by resetting the SMC. Verify issue resolved.		
		No	Go to step 2.		
2.	Inspect the keyboard flex cable for loose or damaged connections. Align and reseat flex cable to ensure a proper connection. Reconnect the keyboard flex cable to the logic board and retest.  Does power button function normally?	Yes	Issue resolved by reseating the cable. Verify issue resolved.		
		No	Go to step 3.		
3.	<b>Important:</b> Disconnect keyboard flex cable to logic board.  On the logic board there are two power-on pads that can be shorted to power on a computer. Refer to Apple Support article <a href="#">TP695: Portables: Power-On Pads</a> for exact location of each model's power-on pads.  <b>Note:</b> Be extra careful not to touch any other components to avoid damaging the logic board.  Did the computer start up?	Yes	Replace top case. Verify issue resolved.	X14	KEYBOARD
		No	Go to "No Power" troubleshooting flow.		
4.	Start up, shut down and restart the computer using the power button to verify the repair.  Is the issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Battery Leaking or Swollen

## Unlikely causes:

AirPort/Bluetooth card(s), display clamshell, fan, hard drive, heat sink, logic board, MagSafe board, memory, optical drive, power adapter, speakers


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Trackpad button does not work, or is stuck and won't release.</li><li>Computer does not run on battery power alone.</li><li>Seams in battery case are separating, exposing cells.</li><li>Computer wobbles and won't sit evenly on flat surface.</li><li>Bottom case cannot be reinstalled.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check for correct installation of bottom case.</li><li>For models with removable batteries, remove battery. Check trackpad button to see if functionality returns.</li><li>See Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a> to check for causes that would prevent correct installation of bottom case or battery.</li><li>Check Apple Support article <a href="#">TS2358: Mac notebooks: Troubleshooting swollen or expanded batteries</a> for possible warranty coverage under a repair extension.</li><li>See Apple Support article <a href="#">HT3400: About liquid contact indicators (LCI) on portable and desktop computers</a> for clues regarding liquid-spill damage.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Follow the guidelines in Apple Support article <a href="#">OP24: Safely Handling Lithium Ion and Lithium Polymer Batteries</a> . Disconnect and remove the battery. Inspect it for any sign of puncture, leakage, or deformation.  Is battery punctured, leaking, or deformed?	Yes	Remove any foreign material in the battery bay. Replace battery. See Apple Support article <a href="#">OP24: Safely Handling Lithium Ion and Lithium Polymer Batteries</a> for instructions on how to dispose of a leaking battery. Verify issue resolved.	P13	BATTERY
		No	Go to step 2.		
2.	Reinstall battery. Check that battery can be inserted correctly into battery bay. Verify bottom case sits evenly.  Can battery and bottom case both be installed correctly?	Yes	Go to step 5.		
		No	Go to step 3.		
3.	Disconnect and/or remove battery. Inspect battery bay for foreign material. Use compressed air to remove any dust or debris. Reinstall/reconnect battery and verify battery connector can be fully seated and is correctly aligned. Make sure bottom case can be installed correctly.  Do battery and bottom case seat correctly?	Yes	Issue resolved by cleaning out the battery bay. Verify resolution.		
		No	Go to step 4.		

	Check	Result	Action	Code	Commodity
4.	<p>Inspect the top case and the bottom cover for damage or defect (bent corner, dents, etc.) that could explain the uneven battery seating.</p> <p>Do top or bottom cases show any signs of damage that would prevent correct battery seating?</p>	Yes	Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a> .		
		No	Go to step 5.		
5.	<p>Reinstall battery, start up computer. Verify trackpad click functions normally.</p> <p>Does trackpad click work as expected?</p>	Yes	Issue resolved by reseating battery. Verify resolution.		
		No	Go to step 6.		
6.	<p>Connect power adapter, remove battery. Verify trackpad click functions normally.</p> <p>Does trackpad click work as expected?</p>	Yes	Go to step 7.		
		No	Go to “Built-in Trackpad Does Not Track Properly” troubleshooting flow.		
7.	<p>To troubleshoot this issue completely, a known-good battery is required.</p> <p>Do you have immediate access to a known-good battery?</p>	Yes	Go to step 8.		
		No	Replace battery. For positioning on warranty coverage, refer to Apple Support article <a href="#">OP13: SERVICE: Notebook Computer Battery and Adapter Screening Process</a> . Verify issue resolved.	P13	BATTERY
8.	<p>Substitute a known-good battery and verify trackpad click functions normally.</p> <p>Does trackpad click work as expected?</p>	Yes	Replace battery. For positioning on warranty coverage, refer to Apple Support article <a href="#">OP13: SERVICE: Notebook Computer Battery and Adapter Screening Process</a> . Verify issue resolved.	P13	BATTERY
		No	Reinstall user’s battery and perform a partless repair using the trackpad adjustment process. Verify resolution.		

	Check	Result	Action	Code	Commodity
9.	Run Mac Resource Inspector (MRI) and verify that computer passes all tests, especially battery diagnostics. Also verify that the trackpad click functions normally.  Is issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	P99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Battery Not Recognized or Does Not Charge

## Unlikely causes:

AirPort/Bluetooth card(s), bottom case, display clamshell, fan, hard drive, heat sink, memory, optical drive, power adapter, top case, trackpad


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>• MagSafe LED does not light up.</li><li>• MagSafe LED illuminates green only—no amber LED to indicate charging.</li><li>• X in battery status menu.</li><li>• No lightning icon in battery status menu when power adapter is connected.</li><li>• Battery indicator light (BIL) behavior:<ul style="list-style-type: none"><li>- single chase across LEDs</li><li>- all LEDs flashing</li><li>- no LEDs</li></ul></li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>1. If external battery indicator light (BIL) on side of enclosure does not light up, verify against battery menu in upper-right corner of screen. Battery indicator LED may be defective while the battery is actually functioning.</li><li>2. Refer to Apple Support article <a href="#">HT2346: Intel-Based Apple Portables: Identifying the right power adapter and power cord</a> to verify correct power adapter (wattage &amp; type) for this computer model.</li><li>3. Test power adapter using Notebook Adapter Diagnostic (NAD) in Apple Service Toolkit (AST).</li><li>4. Try known-good AC outlet, power source, and power adapter with user's computer.</li><li>5. Reset SMC using the procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>6. Perform visual and mechanical inspection of MagSafe port. Remove any debris.</li></ol>


## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Attach a known-good power adapter to user's computer, and check LED on power adapter's MagSafe connector.  Does the LED light up and stay green, or is the LED off?	LED Stays Green	Go to step 2.		
		LED is Off	Go to "No Power" troubleshooting flow.		
2.	Start up computer and check if there is an X in the battery menu icon, indicating installed battery is not recognized.  Is there an X in the battery menu icon?	Yes	Go to step 3.		
		No	Go to step 7.		
3.	Press Option (Alt) key while clicking on the battery menu icon. Check if menu shows "Your battery needs service" or "Service Battery".  Does menu indicate that battery needs service?	Yes	Go to step 9.		
		No	Go to step 4.		
4.	Reseat battery connection to logic board. Verify the battery is recognized and charging.  Does computer run from and charge the user's battery?	Yes	Issue resolved by reseating battery cable. Reinstall user's battery. Verify resolution.		
		No	Go to step 5.		

	Check	Result	Action	Code	Commodity
5.	To completely troubleshoot this issue, a known-good battery is required.  Do you have immediate access to a known-good battery?	Yes	Go to step 6.		
		No	Go to step 9.		
6.	Substitute a known-good battery. Verify battery is recognized and charging.  Does computer run from and charge a known-good battery?	Yes	Go to step 9.		
		No	Replace logic board. Reinstall user's battery. Verify issue resolved.	M20	MLB
7.	Verify if battery menu indicates that battery is charging.  Does menu show battery is charging?	Yes	Go to step 8.		
		No	Go to step 9.		
8.	Press external BIL button on side of enclosure. Verify LEDs display accurate battery status.  Do BIL LEDs show correct battery status?	Yes	Go to step 9.		
		No	Go to step 17.		
9.	With user's battery installed, run Mac Resource Inspector (MRI) to verify battery health. Check if MRI reports battery status as Good.  Does MRI report battery health as Good?	Yes	Go to step 10.		
		No	Go to step 11.		
10.	If health of battery is reported Good, check to see if battery is still covered by Apple's one-year limited warranty or by an AppleCare Protection Plan.  Is battery in warranty?	Yes	Battery is within specifications. Battery should continue to function until consumed. Recommend user consult <a href="http://www.apple.com/batteries">www.apple.com/batteries</a> .		
		No	Battery is out of warranty. Battery should continue to function until consumed.  If issue recurs, user will need to purchase a replacement battery.		
11.	Specify whether negative result for battery status is Consumed (Depleted) or Defective (Bad).  Does MRI report battery status as Consumed or Defective?	Consumed	Battery has been consumed. User will need to purchase a replacement battery.		
		Defective	Go to step 12.		
12.	If battery health is reported as Defective (Bad), verify if battery is still covered by Apple's one-year limited warranty or by an AppleCare Protection Plan.  Is battery IN or OUT of warranty?	In Warranty	Go to step 13.		
		Out of Warranty	Battery is out of warranty. User will need to purchase a replacement battery.		
13.	<ul style="list-style-type: none"> <li>• <b>Battery Runtime Too Short</b></li> <li>• Battery Will Not Charge</li> <li>• Battery Not Recognized</li> <li>• Battery Won't Run</li> </ul> Does this symptom best define the battery issue?	Yes	Replace battery. Verify issue resolved.	P09	BATTERY
		No	Go to step 14.		

	Check	Result	Action	Code	Commodity
14.	<ul style="list-style-type: none"> <li>Battery Runtime Too Short</li> <li><b>Battery Will Not Charge</b></li> <li>Battery Not Recognized</li> <li>Battery Won't Run</li> </ul> <p>Does this symptom best define the battery issue?</p>	Yes	Replace battery. Verify issue resolved.	P10	BATTERY
		No	Go to step 15.		
15.	<ul style="list-style-type: none"> <li>Battery Runtime Too Short</li> <li>Battery Will Not Charge</li> <li><b>Battery Not Recognized</b></li> <li>Battery Won't Run</li> </ul> <p>Does this symptom best define the battery issue?</p>	Yes	Replace battery. Verify issue resolved.	P11	BATTERY
		No	Go to step 16.		
16.	<ul style="list-style-type: none"> <li>Battery Runtime Too Short</li> <li>Battery Will Not Charge</li> <li>Battery Not Recognized</li> <li><b>Battery Won't Run</b></li> </ul> <p>Does this symptom best define the battery issue?</p>	Yes	Replace battery. Verify issue resolved.	P12	BATTERY
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
17.	Reseat sleep sensor / BIL cable connection to logic board.	Yes	Battery charge appears functional. Verify issue resolved.		
	Do BIL LEDs show correct battery status?	No	Go to step 18.		
18.	To completely troubleshoot this issue, a known-good sleep sensor / BIL board is required.	Yes	Go to step 19.		
	Do you have immediate access to a known-good sleep sensor / BIL board?	No	Replace sleep sensor / BIL board. Verify issue resolved.	X03	OTHER ELECTRIC
19.	Substitute a known-good sleep sensor / BIL board. Verify battery status is available when pressing BIL button.	Yes	Replace sleep sensor / BIL board. Verify issue resolved.	X03	OTHER ELECTRIC
	Is battery status available when pressing BIL button?	No	Replace logic board. Verify issue resolved.	M20	MLB



	Check	Result	Action	Code	Commodity
20.	Connect power adapter and verify that MagSafe connector LED lights up amber. Let battery charge for some time, then run computer from battery for only a few minutes. Reconnect power adapter and verify that computer correctly detects the adapter and charges the battery.  Is the issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Battery Runtime Too Short

## Unlikely causes:


AirPort/Bluetooth card(s), bottom case, display clamshell, fan(s), hard drive, heat sink, logic board, MagSafe board, memory, optical drive, top case, trackpad

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Battery runs out of power very quickly (in less than two hours).</li><li>Battery runs out of power without warning.</li><li>Battery menu says "Service Battery", "Replace Now", or "Replace Soon".</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>The battery low-power warning message may have been disabled. Refer to Apple Support article <a href="#">TS1970: Apple Portables: Low power warning does not appear while running off of the battery</a>.</li><li>Verify applications are not forcing CPU or GPU to work overtime and consume unnecessary battery power. Refer to Apple Support article <a href="#">TS1473: Runaway applications can shorten battery runtime</a>. To help extend battery performance, refer user to Apple Support article <a href="#">HT1446: Apple Portables: Tips for maximizing your battery charge</a>.</li><li>Reset SMC using the procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>Refer to Apple Support article <a href="#">HT2346: Intel-Based Apple Portables: Identifying the right power adapter and power cord</a> to verify correct power adapter (wattage and type) for this computer model.</li><li>Inspect user's power adapter connector and cables for damage. Inspect computer's MagSafe port for dust or debris, damaged pins, or magnetically attracted metal fragments. Clean both connector and port, if necessary. Refer to Apple Support article <a href="#">TS1713: Apple Portables: Troubleshooting MagSafe adapters</a>. If there are any signs of damaged, burned, or collapsed connector pins or wires on the adapter, use a known-good adapter for further troubleshooting. Address the power adapter as a separate issue.</li><li>Refer to Apple Support article <a href="#">OP9: Battery Updates and Programs</a> to verify if the battery requires an update or is covered under a repair extension program.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	With user's power adapter connected, run Mac Resource Inspector (MRI) to check for power adapter presence and battery status.	Yes	The battery is nearly or fully consumed. Advise user that consumed batteries are not covered under Apple warranty. Replace battery if user approves out-of-warranty costs. Verify issue resolved.	P18	BATTERY
	Is battery reported as consumed (yellow icon)?	No	Go to step 2.		
2.	Review battery status in MRI to determine if battery is defective.	Yes	Replace battery. Verify issue resolved.	P19	BATTERY
	Is battery reported as failing (red highlight)?	No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	Start up computer to determine the installed version of OS X.  Is OS X 10.6 or newer installed?	Yes	Go to step 4.		
		No	Go to step 5.		
4.	Refer to Apple Support article <a href="#">HT3782: Mac OS X v10.6: About the Battery menu bar extra for portable Macs</a> . Press Option (Alt) key while clicking on battery menu to show battery's health status.  Does battery status show "Replace Soon," "Replace Now," or "Service Battery"?	Yes	The battery is nearly or fully consumed. Advise user that consumed batteries are not covered under Apple warranty. Replace battery if user approves out-of-warranty costs. Verify issue resolved.	P18	BATTERY
		No	Go to step 5.		
5.	Inspect user's power adapter connector and cables for damage.  Inspect computer's MagSafe port for dust, debris, damaged pins, or magnetically attracted metal fragments.  Clean both connector and port, if necessary. Refer to Apple Support article <a href="#">TS1713: Apple Portables: Troubleshooting MagSafe adapters</a> .  Does user's power adapter have damaged connector pins or wires?	Yes	Replace power adapter. Verify issue resolved.	P16	ADAPTER
		No	Go to step 6.		
6.	Connect user's power adapter to the computer and run Apple Service Toolkit (AST). Choose Notebook Adapter Diagnostic (NAD) to test power adapter.  Did user's power adapter fail NAD?	Yes	Go to step 7.		
		No	Recommend that user refer to <a href="http://www.apple.com/batteries">www.apple.com/batteries</a> for tips to maximize battery life and schedule calibrations with iCal.		
7.	Substitute a known-good power adapter with correct wattage for this computer model.  Retest with NAD.  Did known-good power adapter fail NAD?	Yes	Go to "No Power" troubleshooting flow.		
		No	Replace the power adapter. Verify issue resolved.	P23	ADAPTER
8.	Verify that battery runtime is now within specification.  Is the issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Does Not Run on Power Adapter

## Unlikely causes:

AirPort/Bluetooth card(s), bottom case, display clamshell, fans, hard drive, heat sink, memory, optical drive, speakers, top case, trackpad


## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Runs on battery, but not on power adapter alone.</li><li>Low-battery warning appears on screen when trying to power on system</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Verify power outlet is functional.</li><li>Verify correct power adapter is being used for this computer model. See Apple Support article <a href="#">HT2346: Intel-Based Apple Portables: Identifying the right power adapter and power cord</a>.</li><li>Check power adapter, duckhead, cable, and MagSafe connector for damage, such as bent plug pins, frayed or exposed wiring, or burn marks. Refer to Apple Support article <a href="#">TS1713: Apple Portables: Troubleshooting MagSafe adapters</a>.</li><li>Check for dirty or stuck pins on the MagSafe connectors, check both on the power adapter and on computer. Clean and/or adjust MagSafe connectors/pins accordingly.</li><li>Reset SMC using the procedure listed for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>Connect user's power adapter to a known-good computer. The LED on the MagSafe connector should turn green or amber.</li><li>Try user's power cord or duckhead with a known-good power adapter.</li><li>Try user's power adapter with a known-good power cord or duckhead.</li><li>Connect user's power adapter to a known-good computer, and run Notebook Adapter Diagnostic (NAD) to confirm power adapter health.</li><li>Connect known-good power adapter to user's computer, and run NAD to confirm computer's health.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Reset SMC using the procedure listed for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a> .	Yes	Go to step 7.		
	Connect a known-good power adapter to computer and verify MagSafe connector LED lights up green or amber.	No	Go to step 2.		
	Does MagSafe LED on known-good power adapter light up?				
2.	Inspect computer's MagSafe port for dirty or stuck pins. Clean and/or align MagSafe port.	Yes	Go to step 7.		
		No	Go to step 3.		
	Does MagSafe LED on known-good power adapter light up?				

	Check	Result	Action	Code	Commodity
3.	Inspect MagSafe board and port for damage, soot, or visibly failed components.  Is the MagSafe board damaged?	Yes	Replace MagSafe board. Verify issue resolved.	X03	OTHER BOARD
		No	Go to step 4.		
4.	Reseat MagSafe board to logic board. Reassemble computer and connect a known-good power adapter. Verify MagSafe connector LED lights up and computer starts up and stays on.  Does computer start up and stay on?	Yes	Go to step 8.		
		No	Go to step 5.		
5.	To troubleshoot this issue completely, a known-good MagSafe board is required.  Do you have immediate access to a known-good MagSafe board?	Yes	Go to step 6.		
		No	Replace MagSafe board. Verify issue resolved.	X03	OTHER BOARD
6.	Substitute a known-good MagSafe board. Reassemble computer and connect a known-good power adapter. Verify MagSafe connector LED lights up and computer starts up and stays on.  Does computer start up and stay on?	Yes	Replace MagSafe board. Verify issue resolved.	X03	OTHER BOARD
		No	Replace logic board. Reinstall user's MagSafe board. Verify issue resolved.	M21	MLB
7.	Continue to use known-good power adapter. Verify computer can start up, stay on, and charge battery, if not fully, then more than 94 percent.  Does computer start up and stay on?	Yes	Go to step 8.		
		No	Go to "Will Not Start Up" troubleshooting flow.		
8.	Disconnect battery, connect a known-good power adapter, and verify computer starts up and stays on.  Does computer start up and stay on with battery removed?	Yes	Go to step 14.		
		No	Go to step 9.		
9.	Inspect computer's MagSafe port for dirty or stuck pins. Clean and/or align MagSafe port accordingly.  Retest with a known-good power adapter and battery removed.  Does computer start up and stay on with battery removed?	Yes	Issue resolved. Verify issue resolution.		
		No	Go to step 10.		
10.	Inspect MagSafe board and port for damage, soot, or visibly failed components.  Is MagSafe board damaged?	Yes	Replace MagSafe board. Verify issue resolved.	X03	OTHER BOARD
		No	Go to step 11.		
11.	Reseat MagSafe board to logic board. Leave battery disconnected.  Reassemble computer and connect a known-good power adapter. Verify MagSafe connector LED lights up and computer starts up and stays on.  Does computer start up and stay on with battery removed?	Yes	Issue resolved. Verify issue resolution.		
		No	Go to step 12.		

	Check	Result	Action	Code	Commodity
12.	To troubleshoot this issue completely, a known-good MagSafe board is required.	Yes	Go to step 13.		
	Do you have immediate access to a known-good MagSafe board?	No	Replace MagSafe board. Verify issue resolved.	X03	OTHER BOARD
13.	Substitute a known-good MagSafe board. Leave battery disconnected.	Yes	Replace MagSafe board. Verify issue resolved.	X03	OTHER BOARD
	Connect a known-good power adapter. Verify MagSafe connector LED lights up and computer starts up and stays on.  Does computer start up and stay on with battery removed?	No	Replace logic board. Reinstall user's MagSafe board. Verify issue resolved.	M21	MLB
14.	With battery still disconnected, connect user's power adapter and verify computer starts up and stays on.	Yes	Go to step 15.		
	Does computer start up and stay on?	No	Replace power adapter. Verify issue resolved.	P14	ADAPTER
15.	Connect user's battery. Discharge user's battery to below 50 percent.	Yes	Issue resolved. Verify issue resolution.		
	Verify user's power adapter will support computer operation (start up and stay on) while charging user's battery.  Does computer start up and stay on and continue to charge battery?	No	Go to step 16.		
16.	Substitute a known-good power adapter and verify that it will support computer operation (start up and stay on) while charging user's battery.	Yes	Replace power adapter. Verify issue resolved.	P14	ADAPTER
	Does computer start up and stay on and continue to charge battery?	No	Go to step 17.		
17.	To troubleshoot this issue completely, a known-good battery is required.	Yes	Go to step 18.		
	Do you have immediate access to a known-good battery?	No	Replace battery. Verify issue resolved.	P10	BATTERY
18.		Yes	Replace battery. Verify issue resolved.	P10	BATTERY
	Discharge a known-good battery below 50 percent. Verify user's power adapter will support computer operation (start up and stay on) while charging known-good battery.  Does computer start up and stay on and continue to charge battery?	No	 <p><b>ESCALATION REQUIRED.</b></p> <p><b>Intermittent power issue:</b> Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	P99	

	Check	Result	Action	Code	Commodity
19.	<p>Verify that the computer will start up and stay on when powered by the battery alone and then the power adapter alone.</p> <p>Confirm that the power adapter will simultaneously support computer operation and battery charging.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	P99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Intermittent Shutdown

## Unlikely causes:

AirPort/Bluetooth card, bottom case, display clamshell, fans, hard drive, MagSafe board, memory, optical drive, speakers, top case

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>Shuts down during startup</li><li>Shuts down unexpectedly during use</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Collect details from user regarding shutdown occurrence and system configuration.<ul style="list-style-type: none"><li>when shutdown occurs on battery power (after running for a while)</li><li>frequency of shutdowns</li><li>which applications are running</li><li>shutdown repeatability</li></ul></li><li>Check battery charge and battery connection status.</li><li>Unplug power adapter from computer then plug power adapter back into computer.</li><li>Check MagSafe connectors on power adapter and computer for dirty or bent pins.</li><li>Hold Shift key during startup to put computer into Safe Mode. See Apple Support article <a href="#">HT1564: Mac OS X: What is Safe Boot, Safe Mode?</a></li><li>Start up the computer using known-good original system media or an up-to-date, bootable OS X volume.</li><li>Run Mac Resource Inspector (MRI) to check fan (motor) and thermal sensor detection and values.</li><li>Reset SMC using the procedure listed for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	A thermal sensor failure or an inoperative fan can cause intermittent shutdowns.	Yes	Go to step 9.		
	Run MRI or consult MRI logs to check for fan or sensor failures.  Did MRI report any fan (motor) or sensor failures?	No	Go to step 2.		
2.	MRI may report a consumed or defective battery, or Notebook Adapter Diagnostic (NAD) may report a defective power adapter. Either issue can cause intermittent shutdowns.	Yes	Go to step 4.		
	Did MRI or NAD report a battery or power adapter failure?	No	Go to step 3.		
3.	Start up from internal drive and attempt to reproduce shutdown symptom(s).	Yes	Go to step 5.		
	Is shutdown event reproducible?	Power Adapter	Go to step 6.		




	Check	Result	Action	Code	Commodity
4.	Specify whether MRI or NAD reported a battery error or a power adapter error.	Battery	Go to “Battery Not Recognized or Does Not Charge” troubleshooting flow.		
	Which component failed: the battery or the power adapter?	Power Adapter	Go to “Does Not Run on Power Adapter” troubleshooting flow.		
5.	Start up computer using known-good original system media or an up-to-date, bootable OS X volume, and verify shutdown issue still occurs.  Does shutdown issue persist?	Yes	Go to step 6.		
		No	Repair disk using Disk Utility.  If issue persists after repair, refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) included with Intel-based Macs</a> , and install correct version and build of OS X on user's hard drive.  Check for and apply the latest software and firmware updates. Verify issue resolved.		
6.	Run ASD OS. Loop test for 8-10 hours. Verify if computer unexpectedly shut down.	Yes	Go to step 7.		
	Did computer unexpectedly shut down?	No	No failure found when looping ASD tests. Using correct positioning, return computer to user with no trouble found. Verify issue resolved.		
7.	Check diagnostic logs to see if ASD is conducting the same test each time computer unexpectedly shuts down.	Yes	Go to step 8.		
	Is ASD consistently running the same test at the point when the computer shuts down?	No	Replace logic board. Verify issue resolved.	M23	MLB

	Check	Result	Action	Code	Commodity
8.	<p>Rerun ASD loop tests until computer unexpectedly shuts down, then immediately run MRI to see if a sensor error is found while computer is still hot.</p> <p>Verify if MRI (or MRI log on AST server) reports any sensor test failures.</p> <p>Does MRI report any sensor test failures?</p>	Yes	Go to step 9.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for assistance troubleshooting previous shutdown causes. Click the Help button in the GSX Toolbar. Select Technical Help with a Repair &gt; Contact Apple.</p>	M99	
9.	<p>Identify specific type of failure reported in MRI or ASD: thermal/fan sensor or voltage/current sensor.</p> <p>Which sensor failure does MRI or ASD report?</p>	Thermal/Fan Sensor	Go to step 10.		
		Voltage/Current Sensor	Replace logic board. Verify issue resolved.	M23	MLB
10.	<p>Identify specific type of failure reported in MRI or ASD: thermal sensor or fan (motor) error.</p> <p>Which sensor failure does MRI or ASD report?</p>	Thermal	Go to step 15.		
		Fan (Motor)	Go to step 11.		
11.	<p>Inspect fan cable and connector for damage, and make sure fan blades aren't obstructed.</p> <p>Is fan cable/connector damaged or is fan blocked?</p>	Yes	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
		No	Go to step 12.		
12.	<p>Reseat fan connector on logic board and retest using MRI/ASD.</p> <p>Does same fan (motor) test failure still occur?</p>	Yes	Go to step 13.		
		No	Run ASD OS in loop mode to verify computer does not unexpectedly shut down. Verify issue resolved.		
13.	<p>To completely troubleshoot this issue, a known-good fan is required.</p> <p>Do you have immediate access to a known-good fan?</p>	Yes	Go to step 14.		
		No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
14.	<p>Substitute a known-good fan and retest using MRI or ASD.</p> <p>Does fan (motor) test still fail with a known-good fan?</p>	Yes	Replace logic board. Reinstall user's fan. Verify issue resolved.	M18	MLB
		No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC

	Check	Result	Action	Code	Commodity
15.	Remove fan. Inspect inner heat sink fin stack and fan for obstructions. Clean and remove any obstructions or debris.	Yes	Go to step 16.		
	Retest with MRI or ASD.  Does MRI or ASD still report a thermal sensor failure?	No	Run ASD OS in loop mode to verify computer does not unexpectedly shut down. Verify issue resolved.		
16.	MRI or ASD should report the name(s) of failing sensor(s).	Yes	Go to step 17.		
	Check test results for a sensor failure named <b>Ts0P</b> or one that begins with <b>TBxx</b> .  Do any failing sensor codes contain Ts0P or TBxx?	No	Go to step 23.		
17.	<ul style="list-style-type: none"> <li><b>Ts0P</b> indicates a trackpad sensor.</li> <li><b>TBxx</b> indicates a battery sensor.</li> </ul>	Trackpad	Go to step 18.		
	Is the failing sensor located on the trackpad or the battery?	Battery	Go to step 21.		
18.	<b>Ts0P</b> error indicates a problem with the trackpad thermal sensor. Inspect and reseal trackpad cable connector to logic board.	Yes	Replace logic board. Verify issue resolved.	M23	MLB
	Is cable connector on logic board damaged?	No	Go to step 19.		
19.	To completely troubleshoot this issue, a known-good trackpad is required.	Yes	Go to step 20.		
	A known-good trackpad can verify SMC communication path to trackpad thermal sensor.  Do you have immediate access to a known-good trackpad?	No	Replace trackpad. Verify issue resolved.	K99	OTHER ELECTRIC
20.	Substitute a known-good trackpad, and run MRI or ASD to verify trackpad thermal sensor is connected and operational.	Yes	Replace logic board. Verify issue resolved.	M23	MLB
	Is trackpad thermal sensor still failing?	No/Other	Replace trackpad. Verify issue resolved.	K99	OTHER ELECTRIC
21.	To completely troubleshoot this issue, a known-good battery is required.	Yes	Go to step 22.		
	<b>TBxx</b> indicates a problem with internal battery sensor(s) or an SMC communication issue between computer and battery.  Do you have immediate access to a known-good battery?	No	Replace battery. Verify issue resolved.	P17	BATTERY
22.	Substitute a known-good battery and run MRI or ASD to verify if <b>TBxx</b> error still occurs.	Yes	Replace logic board. Verify issue resolved.	M23	MLB
	Does TBxx error still occur with known-good battery?	No	Replace battery. Verify issue resolved.	P17	BATTERY

	Check	Result	Action	Code	Commodity
23.	In some MacBook Pro models, the heat sink has its own built-in thermal sensor (Th0H).  Is the failing sensor named Th0H?	Yes	Go to step 24.		
		No	Go to step 28.		
24.	Remove logic board and check heat sink sensor cable connection to logic board. Reseat, reassemble and retest to see if Th0H heat sink sensor issue is resolved.  Does the Th0H sensor failure persist?	Yes	Go to step 25.		
		No	Issue resolved by connecting or reseating thermal sensor connector to logic board. Verify resolution.		
25.	Remove logic board and heat sink, wipe away existing thermal material, and apply new material. Reinstall heat sink onto logic board, tightening heat sink screws with sufficient torque.  Retest with MRI.  Does the Th0H sensor failure persist?	Yes	Go to step 26.		
		No	Issue resolved by replacing thermal material. Verify resolution.		
26.	To completely troubleshoot this issue, a known-good heat sink is required to verify the sensor-to-SMC connection on the logic board.  Do you have immediate access to a known-good heat sink?	Yes	Go to step 27.		
		No	Replace heat sink. Verify issue resolved.	X10	
27.	Substitute a known-good heat sink and apply thermal material. Reassemble and retest.  Does the Th0H sensor failure persist?	Yes	Replace logic board. Verify issue resolved.	M08	MLB
		No	Replace heat sink. Verify issue resolved.	X10	
28.	The logic board has built-in heat sink fin stack proximity sensors (Th1H, Th2H) that monitor external thermal proximity from the heat sink.  Is the failing sensor named either Th1H or Th2H?	Yes	Go to step 29.		
		No	Replace logic board. Verify issue resolved.	M18	MLB
29.	To completely troubleshoot this issue, a known-good fan is required.  Do you have immediate access to a known-good fan?	Yes	Go to step 30.		
		No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
30.	Substitute a known-good fan and retest.  Does fan (motor) test continue to fail with a known-good fan?	Yes	Replace logic board. Reinstall user's fan. Verify issue resolved.	M18	MLB
		No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC

	Check	Result	Action	Code	Commodity
31.	Run ASD in OS loop mode for 8-10 hours to verify that the computer does not unexpectedly shut down.  Is the issue resolved?	Yes	Issue resolved.		
		No	  <b>ESCALATION REQUIRED.</b>  Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar > Technical Help with a Repair > Contact Apple.	M99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Kernel Panic / System Crashes

## Unlikely causes:

Battery, bottom case, MagSafe board, power adapter, speakers, top case, trackpad


## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>Computer displays a kernel panic alert message. See Apple Support article <a href="#">TS3742: "You need to restart your computer" (kernel panic) message appears (Mac OS X v10.5, 10.6)</a>.</li><li>Computer freezes during use.</li><li>Computer freezes upon wake from sleep.</li><li>Computer freezes when AirPort is enabled or activated.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Check for and apply latest software and firmware updates.</li><li>Remove suspected external devices.</li><li>Verify memory configuration matches actual amount of installed physical memory.</li><li>Hold Shift key during startup to put computer into Safe Mode. See Apple Support article <a href="#">HT1564: Mac OS X: What is Safe Boot, Safe Mode?</a></li><li>Start up computer using known-good original system media or an up-to-date, bootable OS X volume. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li><li>Check kernel panic log file to look for crash cause. See Apple Support article <a href="#">HT2546: Mac OS X: How to log a kernel panic</a>.</li><li>If issue cannot be easily reproduced, run Apple Service Diagnostic (ASD) for longer, looping or OS tests.</li></ol>


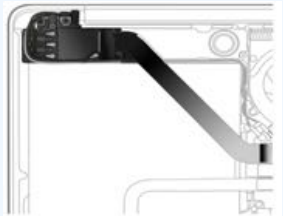
## Deep Dive





	Check	Result	Action	Code	Commodity
1.	A voltage, current or thermal sensor failure or an inoperative fan can cause kernel panics or system crashes. Run Macintosh Resource Inspector (MRI) or consult MRI logs to check for any sensor or fan failures.  Does MRI report any sensor or fan failures?	Yes	Go to step 3.		
		No	Go to step 2.		
2.	Reset SMC using procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a> .  Then reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.  Does computer start up without kernel panic?	Yes	Issue resolved by SMC/PRAM reset. Verify resolution.		
		No	Go to step 14.		
3.	Identify failure reported in MRI: sensor failure or fan (motor) error.  Which failure does MRI report: sensor or fan?	Sensor	Go to step 7.		
		Fan	Go to step 4.		

	Check	Result	Action	Code	Commodity
4.	Reseat affected fan cable to logic board and retest with MRI.	Yes	Go to step 5.		
	Does MRI still indicate a fan failure?	No	Issue resolved by reseating fan cable. Verify resolution.		
5.	To completely troubleshoot this issue, a known-good fan is required.	Yes	Go to step 6.		
	Do you have immediate access to a known-good fan?	No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
6.	Substitute a known-good fan and retest with MRI.	Yes	Replace logic board. Reinstall user's fan. Verify issue resolved.	M18	MLB
	Does MRI still indicate a fan failure?	No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
7.	Verify if any of the following voltage sensor tests failed in MRI:	Yes	Replace logic board. Verify issue resolved.	M06	MLB
	<ul style="list-style-type: none"> <li>• DC in Rail 0</li> <li>• PBus</li> <li>• CPU V Core</li> <li>• MCP or GPU VCore</li> <li>• AXG V Core</li> </ul> Did MRI report failures in any voltage sensor tests listed above?	No	Go to step 8.		
8.	Verify if any of the following current sensor tests failed in MRI:	Yes	Replace logic board. Verify issue resolved.	M06	MLB
	<ul style="list-style-type: none"> <li>• DC In</li> <li>• Battery</li> <li>• Computing (combined cores)</li> <li>• GPU Core</li> <li>• Other &lt;5V, 3.3V&gt;</li> </ul> Did MRI report failures in any current sensor tests listed above?	No	Go to step 9.		
9.	Verify if any of the following thermal sensor tests failed in MRI:	Yes	Go to step 10.		
	<ul style="list-style-type: none"> <li>• (TCxx) CPU core Dies or Proximity</li> <li>• (TGxx, TMxx, TNxx, TPxx, ) GPU, MCP, PCH Dies or Proximity</li> <li>• (Tmxx, TMxx) MLB, DC In or Battery Charger Proximity</li> </ul> Did MRI report failures in any thermal sensor tests listed above?	No	Go to step 13.		

	Check	Result	Action	Code	Commodity
10.	These sensors are located on logic board. Remove logic board and heat sink, wipe away existing thermal material and apply new material. Reinstall heat sink onto logic board, tightening heat sink screws with sufficient torque. If present, reconnect heat sink sensor (TG1H).  Does MRI still report failures in any of these thermal sensor tests?	Yes	Go to step 11.		
		No	Issue resolved by reseating heat sink or applying new thermal material. Verify resolution.		
11.	To completely troubleshoot this issue, a known-good logic heat sink is required.  Do you have immediate access to a known-good heat sink?	Yes	Go to step 12.		
		No	Replace heat sink. Verify issue resolved.	X10	OTHER ELECTRIC
12.	Substitute a known-good heat sink and apply new thermal material. Retest using MRI and check that PRI does not report any of the following thermal sensor errors:  <ul style="list-style-type: none"> <li>• (TCxx) CPU core Dies or Proximity</li> <li>• (TGxx, TMxx, TNxx, TPxx, ) GPU, MCP, PCH Dies or Proximity</li> <li>• (Tmxx, TMxx) MLB, DC In or Battery Charger Proximity</li> </ul> Does MRI still report failures in any thermal sensor tests?	Yes	Replace logic board. Verify issue resolved.	M06	MLB
		No	Replace heat sink. Verify issue resolved.	X10	OTHER ELECTRIC
13.	Check if any of the following thermal sensor tests failed in MRI:  <ul style="list-style-type: none"> <li>• (THxx) Right/Left Heat Pipe Fin Stack Proximity</li> <li>• (TS0P) Palm Rest</li> <li>• (TBxT) Battery Thermal Diode 1, 2, or MAX</li> </ul> Did MRI report failures in any of the thermal sensor tests listed above?	Yes	Go to “Computer Runs Hot” troubleshooting flow.		
		No	 <b>ESCALATION REQUIRED.</b>  <b>Unlisted sensor failure.</b> Escalate to TSPS. Click Help button in GSX toolbar > Technical Help with a Repair > Contact Apple.	M99	
14.	Start up computer using known-good original system media or an up-to-date, bootable OS X volume. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.  Does computer still encounter crashes or kernel panics?	Yes	Go to step 15.		
		No	Go to step 38.		




	Check	Result	Action	Code	Commodity
15.	Hold Shift key during startup to put computer into Safe Mode. See Apple Support article <a href="#">HT1564: Mac OS X: What is Safe Boot, Safe Mode?</a>  Does computer still encounter crashes or kernel panics?	Yes	Go to step 16.		
		No	Go to step 18.		
16.	Remove installed memory modules and substitute one by one with a known-good memory module.  Does computer still encounter crashes or kernel panics with known-good memory installed?	Yes	Go to step 17.		
		No	Isolate and replace memory module. <b>Note:</b> Only replace a defective memory module. There is no need to replace memory in pairs. Verify issue resolved.	X01	MEMORY
17.	Check logic board memory slots one by one, using a known-good memory module, to isolate a memory slot failure.  Does computer kernel panic occur when only one memory module is installed in a specific slot?	Yes	Replace logic board. Reinstall user's memory. Verify issue resolved.	M06	MLB
		No	Go to step 18.		
18.	Issue may come from AirPort card connection. Depending on computer model, AirPort card might be either: <ul style="list-style-type: none"> <li>standalone AirPort card in hinge barrel of display clamshell (connected though camera cable)</li> <li>AirPort/Bluetooth combo card on optical drive</li> </ul> <b>Standalone AirPort card:</b>    <b>AirPort/Bluetooth combo card:</b>    Which type of AirPort card does this computer have?	Standalone AirPort Card	Go to step 19.		
		AirPort/Bluetooth Combo Card	Go to step 25.		

	Check	Result	Action	Code	Commodity
19.	Shut down computer and wait 30 seconds. Disconnect camera cable from logic board, and retest.  Does kernel panic or crash still occur?	Yes	Go to step 31.		
		No	Go to step 20.		
20.	Remove display clamshell and clutch barrel. Disconnect AirPort card from its cable, reconnect LVDS and camera cables to logic board, then retest.  Does kernel panic or crash still occur?	Yes	Go to step 23.		
		No	Go to step 21.		
21.	To completely troubleshoot this issue, a known-good AirPort card is required.  Do you have immediate access to a known-good AirPort card?	Yes	Go to step 22.		
		No	Replace AirPort card. <b>Note correct cable orientation</b> when reconnecting card. Verify issue resolved. 	N13	WIRELESS DEVICE
22.	Substitute a known-good AirPort card. <b>Note correct cable orientation</b> when connecting card. Retest.   Does kernel panic or crash still occur?	Yes	Replace logic board. Reinstall user's AirPort card. <b>Note correct cable orientation</b> when reconnecting card. Verify issue resolved. 	M06	MLB
		No	Replace AirPort card. <b>Note correct cable orientation</b> when reconnecting card. Verify issue resolved. 	N13	WIRELESS DEVICE
23.	To completely troubleshoot this issue, a known-good display clamshell is required.  Do you have immediate access to a known-good display clamshell?	Yes	Go to step 24.		
		No	Replace display clamshell. Verify issue resolved.	L99	LCD

	Check	Result	Action	Code	Commodity
24.	Substitute a known-good display clamshell and retest.	Yes	Replace logic board. Reinstall user's display clamshell. Verify issue resolved.	M06	MLB
	Does kernel panic or crash still occur?	No	Replace display clamshell. Verify issue resolved.	L99	LCD
25.	Shut down computer and wait 30 seconds. Disconnect AirPort/Bluetooth flex cable from logic board and retest.	Yes	Go to step 31.		
	Does computer still encounter crashes or kernel panics?	No	Go to step 26.		
26.	Disconnect cable from AirPort/Bluetooth card end and reconnect its other end on logic board.	Yes	Go to step 29.		
	Does computer still encounter crashes or kernel panics?	No	Go to step 27.		
27.	To completely troubleshoot this issue, a known-good AiPort/Bluetooth card is required.	Yes	Go to step 28.		
	Do you have immediate access to a known-good AirPort/Bluetooth card?	No	Replace AirPort/Bluetooth card. Verify issue resolved.	N13	WIRELESS DEVICE
28.	Substitute a known-good AirPort/Bluetooth card and retest.	Yes	Replace logic board. Reinstall user's Airport/Bluetooth card. Verify issue resolved.	M06	MLB
	Does computer still encounter crashes or kernel panics?	No	Replace AirPort/Bluetooth card. Verify issue resolved.	N13	WIRELESS DEVICE
29.	To completely troubleshoot this issue, a known-good AirPort/Bluetooth flex cable is required.	Yes	Go to step 30.		
	Do you have immediate access to a known-good AirPort/Bluetooth flex cable?	No	Replace AirPort/Bluetooth flex cable. Verify issue resolved.	X03	INTERNAL CABLE
30.	Substitute a known-good AirPort/Bluetooth flex cable and retest.	Yes	Replace logic board. Reinstall user's AirPort/Bluetooth flex cable. Verify issue resolved.	M06	MLB
	Does computer encounter crashes or kernel panics?	No	Replace AirPort/Bluetooth flex cable. Verify issue resolved.	X03	INTERNAL CABLE
31.	Disconnect optical drive flex cable from logic board and retest.	Yes	Go to step 35.		
	Does computer still encounter crashes or kernel panics?	No	Go to step 32.		
32.	Inspect optical drive connector on logic board for damage.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
	Is optical drive connector on logic board damaged?	No	Go to step 33.		

	Check	Result	Action	Code	Commodity
33.	To completely troubleshoot this issue, a known-good optical drive flex cable is required.  Do you have immediate access to a known-good optical drive flex cable?	Yes	Go to step 34.		
		No	Replace optical drive flex cable. Verify issue resolved.	X03	INTERNAL CABLE
34.	Substitute a known-good optical drive flex cable and connect it to user's optical drive. Connect cable to logic board, and retest.  Does computer still encounter crashes or kernel panics?	Yes	Replace optical drive. Reinstall user's optical drive flex cable. Verify issue resolved.	J03	OPTICAL
		No	Replace optical drive flex cable. Verify issue resolved.	X03	INTERNAL CABLE
35.	Disconnect hard drive connector cable from logic board. Start up from known-good original system media or an up-to-date, bootable OS X volume.  Does computer still encounter crashes or kernel panics?	Yes	Go to step 41.		
		No	Go to step 36.		
36.	To completely troubleshoot this issue, the following known-good parts are required.  <ul style="list-style-type: none"> <li>• Hard drive</li> <li>• Front hard drive bracket/hard drive flex cable</li> </ul> Do you have immediate access to each of these known-good parts?	Yes	Go to step 39.		
		No	Go to step 37.		
37.	Reinstall user's hard drive. Start up computer using known-good original system media or an up-to-date, bootable OS X volume and use Disk Utility to repair disk on user's hard drive. If disk repair completes successfully, start up computer from user's hard drive.  Did both the disk repair and the start up from user's hard drive complete without issue?	Yes	Issue resolved after Disk Utility disk repair. Verify resolution.		
		No	Go to step 38.		
38.	Restore OS X on user's hard drive. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.  Does computer still encounter crashes or kernel panics?	Yes	Go to step 45.		
		No	Issue resolved after OS X reinstallation. Verify resolution.		

	Check	Result	Action	Code	Commodity
39.	Substitute a known-good hard drive with an up-to-date, bootable version of OS X installed. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.  Does computer still encounter crashes or kernel panics?	Yes	Go to step 40.		
		No	Go to step 46.		
40.	Continue using known-good hard drive. Substitute a known-good front hard drive bracket/hard drive flex cable (depending on configuration) and retest.  Does computer still encounter crashes or kernel panics?	Yes	Replace logic board. Reinstall user's hard drive and front hard drive bracket/hard drive flex cable. Verify issue resolved.	M06	MLB
		No	Replace front hard drive bracket/hard drive flex cable. Reinstall user's hard drive. Verify issue resolved.	X03	
41.	Remove logic board and heat sink, wipe away existing thermal material and apply new material. Reinstall heat sink onto logic board, tightening heat sink screws with sufficient torque. Reconnect heat sink sensor if present.  Does computer still encounter crashes or kernel panics?	Yes	Go to step 42.		
		No	Issue resolved after replacing thermal material. Verify resolution.		
42.	To completely troubleshoot this issue, a known-good heat sink is required.  Do you have immediate access to a known-good heat sink?	Yes	Go to step 43		
		No	Replace heat sink. Verify issue resolved.	X10	OTHER ELECTRIC
43.	Substitute a known-good heat sink, apply new thermal material, and retest.  Does computer still encounter crashes or kernel panics?	Yes	Replace logic board. Reinstall user's heat sink. Verify issue resolved.	M06	MLB
		No	Replace heat sink. Verify issue resolved.	X10	OTHER ELECTRIC
44.	Run ASD in OS loop mode for 8-10 hours to verify that computer does not encounter a crash or kernel panic.  Is issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

	Check	Result	Action	Code	Commodity
45.	Identify the type of storage device affected:  <ul style="list-style-type: none"> <li>• Hard Disk Drive (HDD)</li> <li>• Flash Storage / Solid-State Drive (SSD)</li> </ul> Is the affected device an HDD or SSD?	HDD	Replace the user's hard drive. Verify issue resolved.	H02	HDD
		SSD	Replace the user's flash storage / SSD. Verify issue resolved.	H02	SSD
46.	Identify the type of storage device affected:  <ul style="list-style-type: none"> <li>• Hard Disk Drive (HDD)</li> <li>• Flash Storage / Solid-State Drive (SSD)</li> </ul> Is the affected device an HDD or SSD?	HDD	Replace the user's hard drive. Verify issue resolved.	H02	HDD
		SSD	Replace the user's flash storage / SSD. Verify issue resolved.	H02	SSD

# MacBook Pro (13-inch, 15-inch, Mid 2012): No Power

## Unlikely causes:

Bottom case, fan, hard drive, heat sink, memory, optical drive, speakers

## Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"><li>• Computer does not power on.</li><li>• No image.</li><li>• No startup sound.</li><li>• No sounds from fan or hard drive.</li><li>• No reset sound from optical drive.</li><li>• No sleep indicator light activity.</li><li>• No Caps Lock light when key is pressed.</li><li>• Non-operational.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>1. Verify correct power adapter is being used for this computer model. See Apple Support article <a href="#">HT2346: Intel-Based Apple Portables: Identifying the right power adapter and power cord</a>.</li><li>2. Test user power adapter with known-good power cord or duckhead.</li><li>3. Test user computer with a known-good power adapter.</li><li>4. Disconnect all peripherals.</li><li>5. Press the battery indicator light (BIL) to verify SMC is monitoring battery, and battery is drained, recognized, or accepting a charge.</li><li>6. Watch sleep indicator light (SIL) for activity. Refer to Apple Support article <a href="#">TS4167: Mac computers: Sleep Indicator Light behavior</a>.</li><li>7. Reset the SMC using the procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li></ol>

## Deep Dive


	Check	Result	Action	Code	Commodity
1.	Press power button to start up computer. Check for any signs of power, such as fan or hard drive activity, startup sound or illuminated Caps Lock LED.	Yes	Go to step 2.		
	Does computer show any signs of power activity?	No	Go to step 4.		
2.	Check for a video signal on the display.	Yes	Run Mac Resource Inspector (MRI) to obtain latest test results. Verify issue resolved.		
	Is a video image clearly visible on the display?	No	Go to step 3.		
3.	Shine a flashlight through the Apple logo on back of display clamshell to check for a video signal.	Yes	Go to “Backlight Issue / No Backlight” troubleshooting flow.		
	Is a video image visible with a flashlight?	No	Go to “Power But Blank/No Video” troubleshooting flow.		

	Check	Result	Action	Code	Commodity
4.	Check for dirty or stuck pins on MagSafe connectors, check both on the power adapter and on computer. Clean and/or adjust MagSafe connectors/pins accordingly. Refer to Apple Support article <a href="#">TS1713: Apple Portables: Troubleshooting MagSafe adapters</a> .	Yes	The user's power adapter is providing power to the user's computer. Issue resolved. Verify resolution.		
	Check power adapter, duckhead, power cable, and MagSafe connector while plugged into a known-good electrical outlet.  Attempt to restart the computer.  Can user's power adapter provide sufficient power to start user's computer and charge the battery?	No	Go to step 5.		
5.	Try user's power adapter with a known-good power cord plugged into a known-good electrical outlet.	Yes	Go to step 6.		
	Attempt to restart the computer.  Does issue persist with known-good power cord?	No	Replace power cord. Verify issue resolved.	X03	EXTERNAL CABLE
6.	Substitute a known-good, compatible power adapter and power cord plugged into a known-good electrical outlet.	Yes	Go to step 7.		
	Attempt to restart the computer.  Does issue persist with known-good power adapter?	No	Replace power adapter. Verify issue resolved.	P01	ADAPTER
7.	Reset the SMC using the procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a> .	Yes	Go to step 8.		
	Does issue persist after SMC reset?	No	Issue resolved. The stuck SMC state prevented computer startup. Verify resolution.		
8.	Inspect MagSafe board and port for damage, soot, or visibly failed components.	Yes	Go to step 9.		
	Is MagSafe board intact and free from damage or defects?	No	Replace MagSafe board. Verify issue resolved.	X03	OTHER BOARD
9.	Connect a known-good power adapter and press BIL button on left side of computer. If any LED activity occurs, then SMC is receiving power.	Yes	Go to step 12.		
	Does BIL show any activity?	No	Go to step 10.		





	Check	Result	Action	Code	Commodity
10.	Disconnect BIL cable from logic board. Press power button to see if computer starts up. Leave BIL disconnected as you proceed through the remaining troubleshooting steps.  Does issue persist with BIL cable disconnected?	Yes	Go to step 12.		
		No	Go to step 11.		
11.	Inspect BIL cable connector on logic board for damage to pins or housing.  Is BIL cable connector on logic board damaged?	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Replace BIL cable/BIL assembly. Verify issue resolved.	X03	
12.	<b>Important:</b> Disconnect keyboard flex cable to logic board.  On the logic board there are two power-on pads that can be shorted to power on a computer. Refer to Apple Support article <a href="#">TP695: Portables: Power-On Pads</a> for exact location of each model's power-on pads.  <b>Note:</b> Be extra careful not to touch any other components to avoid damaging the logic board.  Did the computer start up?	Yes	Go to step 13.		
		No	Go to step 14.		
13.	Reseat keyboard flex cable to logic board and press power button to test the connection.  Does no-power issue persist?	Yes	Replace top case. Verify issue resolved.	X03	KEYBOARD
		No	Issue resolved by reseating keyboard flex cable. Verify resolution.		
14.	Disconnect battery cable from logic board to determine if battery is preventing computer from receiving power.  Connect power adapter. Try to start up computer by shorting logic board power-on pads.  Does no-power issue persist?	Yes	Go to step 22.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>A faulty battery or battery cable is preventing startup. AppleCare is interested in capturing defective batteries. Escalate to TSPS.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

	Check	Result	Action	Code	Commodity
15.	Disconnect trackpad cable from logic board.	Yes	Go to step 18.		
	Attempt to start up computer by shorting logic board power-on pads.	No	Go to step 16.		
	Does no-power issue persist?				
16.	To troubleshoot this issue completely, a known-good trackpad is required.	Yes	Go to step 17.		
	Do you have immediate access to a known-good trackpad?	No	Replace trackpad. Verify issue resolved.	K15	OTHER ELECTRIC
	Substitute a known-good trackpad.	Yes	Go to step 18.		
17.	Start up the computer using known-good original system media or an up-to-date, bootable OS X volume.	No	Replace trackpad. Verify issue resolved.	K15	OTHER ELECTRIC
	Does no-power issue persist?				
	Disconnect LVDS cable from logic board.	Yes	Go to step 21.		
18.	Attempt to start up computer by shorting logic board power-on pads.	No	Go to step 19.		
	Does no-power issue persist?				
	To troubleshoot this issue completely, a known-good display clamshell is required.	Yes	Go to step 20.		
19.	Do you have immediate access to a known-good display clamshell?	Before	Replace display clamshell. Verify issue resolved.	L01	LCD
	Substitute a known-good display clamshell.	Yes	Go to step 21.		
	Attempt to start up computer by shorting logic board power-on pads.	No	Replace display clamshell. Verify issue resolved.	L01	LCD
20.	Does no-power issue persist?				

	Check	Result	Action	Code	Commodity
21.	<p>Disconnect all cables from logic board except fan and speakers. Remove memory. Connect external display.</p> <p>Attempt to start up computer by shorting logic board power-on pads.</p> <p>Observe fan behavior, error beeps, and external display to verify signs of startup activity.</p> <p>Does computer exhibit any signs of power activity?</p>	Yes	 <p><b>ESCALATION REQUIRED.</b></p> <p>Escalate to TSPS. Explain the logic board is at minimum configuration and the computer will not start up. Assistance is needed to determine which removed component is preventing startup.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
		No	Replace logic board. Verify issue resolved.	M01	MLB
22.	<p>Issue may be related to AirPort card connection. Depending on model, the computer will have one of the following cards:</p> <ul style="list-style-type: none"> <li>• <b>AirPort/Bluetooth Combo Card</b> (located on edge of optical drive)</li> <li>• <b>AirPort card in Display Clamshell</b> (located in hinge barrel and connected to logic board via camera cable)</li> </ul> <p>Identify which model you are currently troubleshooting.</p> <p>Does computer have an AirPort/Bluetooth card or is the AirPort card located in display clamshell?</p>	AirPort/Bluetooth Combo Card	Go to step 23.		
		AirPort Card in Clamshell	Go to step 31.		
23.	<p>For a computer with a combination AirPort/Bluetooth card (located on edge of optical drive), disconnect AirPort/Bluetooth cable from logic board. Make sure the trackpad cable is connected.</p> <p>Attempt to start up computer by shorting logic board power-on pads.</p> <p>Does no-power issue persist?</p>	Yes	Go to step 15.		
		No	Go to step 24.		
24.	<p>Inspect AirPort/Bluetooth cable for damage. Check connectors on both ends of cable for bent pins, loose wires, or cracked housing, Check cable for pinching or crimping.</p> <p>Is the AirPort/Bluetooth flex cable or its connectors damaged?</p>	Yes	Replace AirPort/Bluetooth flex cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 25.		

	Check	Result	Action	Code	Commodity
25.	Inspect AirPort/Bluetooth cable connector on logic board for bent pins or housing damage.  Is logic board connector damaged?	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 26.		
26.	Inspect cable connector on AirPort/Bluetooth card for damaged pins or housing.  Is AirPort/Bluetooth card connector damaged?	Yes	Replace AirPort/Bluetooth card. Verify issue resolved.	N17	WIRELESS DEVICE
		No	Go to step 27.		
27.	Reseat AirPort/Bluetooth flex cable to both logic board and AirPort/Bluetooth card.  Does no-power issue persist?	Yes	Go to step 28.		
		No	Issue resolved. Verify resolution.		
28.	To troubleshoot this issue completely, the following known-good parts are required:  <ul style="list-style-type: none"> <li>AirPort/Bluetooth card</li> <li>AirPort/Bluetooth flex cable</li> </ul> Do you have immediate access to each of these known-good parts?	Yes	Go to step 29.		
		No	Replace AirPort/Bluetooth card. Verify issue resolved.	N13	WIRELESS DEVICE
29.	Substitute a known-good AirPort/Bluetooth flex cable.  Start up the computer using known-good original system media or an up-to-date, bootable OS X volume. Verify AirPort and Bluetooth are present.  Does no-power issue persist?	Yes	Go to step 30.		
		No	Replace AirPort/Bluetooth flex cable. Verify issue resolved.	X03	INTERNAL CABLE
30.	Continue using a known-good flex cable. Substitute a known-good AirPort/Bluetooth card.  Start up the computer using known-good original system media or an up-to-date, bootable OS X volume. Verify AirPort and Bluetooth are present.  Does no-power issue persist?	Yes	Replace logic board. Verify issue resolved.	M01	MLB
		No	Replace AirPort/Bluetooth card. Verify issue resolved.	N13	WIRELESS DEVICE
31.	For a computer with an AirPort card in the display clamshell, disconnect camera cable from logic board. Make sure trackpad cable is connected.  Attempt to start up computer by shorting logic board power-on pads.  Does no-power issue persist?	Yes	Go to step 15.		
		No	Go to step 32.		

	Check	Result	Action	Code	Commodity
32.	Inspect display clamshell camera cable for damage. Check connectors for bent pins, loose wires or cracked housing, Check the cable for pinching or crimping.  Is camera cable or its connector damaged?	Yes	Replace display clamshell. Verify issue resolved.	L14	LCD
		No	Go to step 33.		
33.	Inspect camera cable connector on logic board for bent pins or housing damage.  Is logic board connector damaged?	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 34.		
34.	Reseat camera cable connection on logic board and retest.  Does no-power issue persist?	Yes	Go to step 35.		
		No	Issue resolved with reseating the camera cable. Verify resolution.		
35.	To troubleshoot this issue completely, the following known-good parts are required:  <ul style="list-style-type: none"> <li>• Display Clamshell</li> <li>• AirPort card</li> </ul> Do you have immediate access to each of these known-good parts?	Yes	Go to step 37.		
		No	Go to step 36.		
36.	Remove user's clamshell and hinge barrel to access AirPort card. Disconnect cable connection on Airport card, reinstall clamshell, and reconnect camera cable to logic board.  Start up the computer using known-good original system media or an up-to-date, bootable OS X volume.  Does no-power issue persist?	Yes	Replace display clamshell. Verify issue resolved.	L01	LCD
		No	Replace AirPort card. Verify issue resolved.	N13	WIRELESS DEVICE
37.	Disconnect camera cable and connect camera cable from a known-good clamshell with a known-good AirPort card installed.  Start up the computer using known-good original system media or an up-to-date, bootable OS X volume. Verify AirPort and Bluetooth are present.  Does no-power issue persist?	Yes	Replace logic board. Verify issue resolved.	M01	MLB
		No	Go to step 38.		

	Check	Result	Action	Code	Commodity
38.	<p>Verify AirPort and Bluetooth are present and functional.</p> <p>Are both AirPort and Bluetooth functional?</p>	Yes	Replace user's display clamshell. Verify issue resolved.	L01	LCD
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	
39.	<p>Verify that the computer can now complete the startup process over multiple trials.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	X99	

# MacBook Pro (13-inch, 15-inch, Mid 2012): Power Adapter Issues

## Unlikely causes:


AirPort/Bluetooth card(s), battery, bottom case, display clamshell, fan(s), hard drive, heat sink, logic board, MagSafe board, memory, optical drive, speakers, top case, trackpad

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>No power</li><li>No MagSafe LED illumination</li><li>Computer is non-operational</li><li>Stuck or broken MagSafe pins</li><li>Charging battery not allowed (wrong adapter model)</li><li>Battery charge LED not amber with evidence of charging battery</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Verify power outlet is functional.</li><li>Verify correct power adapter is being used for this computer model. See Apple Support article <a href="#">HT2346: Intel-Based Apple Portables: Identifying the right power adapter and power cord</a>.</li><li>Reset SMC using the procedure listed for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>Check for dirty or stuck pins on the MagSafe connectors, check both on the power adapter and on computer. Clean and/or adjust MagSafe connectors/pins accordingly.</li><li>Connect user's power adapter to a known-good computer, and run Notebook Adapter Diagnostic (NAD) to confirm power adapter health.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect the user's power cord or duckhead for bent prongs, frayed or exposed wiring, or burn marks. Refer to Apple Support article <a href="#">TS1713: Apple Portables: Troubleshooting MagSafe adapters</a> .	Yes	Go to step 2.		
	<b>Caution:</b> If a power cord or duckhead is damaged, do not connect it!	No	Go to step 3.		
	Is user's power cord or duckhead damaged?				
2.	Specify which accessory is damaged: the power cord or the duckhead.	Power Cord	Replace power cord. Verify issue resolved.	P16	EXTERNAL CABLE
	Is power cord or duckhead damaged?	Duckhead	Replace duckhead. Verify issue resolved.	P16	PIECE PART
3.	Inspect user's power adapter, cable, and MagSafe connector for damage, such as bent pins, frayed or exposed wiring, or burn marks. Refer to Apple Support article <a href="#">TS1713: Apple Portables: Troubleshooting MagSafe adapters</a> .	Yes	Replace power adapter. Verify issue resolved.	P15	ADAPTER
	Is user's power adapter, cable or MagSafe connector damaged?	No	Go to step 4.		
4.	Connect user's power adapter to a known-good computer and verify that the MagSafe connector LED lights up green (or amber).	Yes	Go to step 5.		
	Does user's power adapter LED light up?	No	Go to step 8.		

	Check	Result	Action	Code	Commodity
5.	With user's power adapter still connected to a known-good computer, press the power button and verify that the computer starts up and stays on.  Does computer start up and stay on with user's power adapter?	Yes	Go to step 6.		
		No	Replace power adapter. Verify issue resolved.	P01	ADAPTER
6.	Discharge known-good computer's battery below 80%. Check whether user's power adapter will support computer operation while charging battery. Sustain testing for 15 minutes to capture and identify intermittent issues.  Does user's power adapter charge the battery while operating the computer?	Yes	Go to step 7.		
		No	Replace power adapter. Verify issue resolved.	P02	ADAPTER
7.	Verify MagSafe LED on user's power adapter lights up amber while charging a known-good computer's battery that is below 95% capacity.  Does user's power adapter LED light up amber while charging the battery?	Yes	Verify issue resolved. If the issue persists, contact TSPS for additional support. Click the Help button in the GSX Toolbar. Select Technical Help with a Repair > Contact Apple.	P99	
		No	Replace power adapter. Verify issue resolved.	P02	ADAPTER
8.	Connect user's duckhead or power cord to a known-good power adapter and test with a known-good computer.  Does user's power cord or duckhead function with known-good power adapter?	Yes	Replace power adapter. Verify issue resolved.	P01	ADAPTER
		No	Go to step 9.		
9.	Specify which accessory is defective: power cord or duckhead.  Is power cord or duckhead defective?	Power Cord	Replace power cord. Verify issue resolved.	P16	EXTERNAL CABLE
		Duckhead	Replace duckhead. Verify issue resolved.	P16	PIECE PART
10.	Test the power adapter, power cord and/or duckhead to confirm that the MagSafe LED lights up, the computer receives power, and the battery charges.  Is the issue resolved?	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	P99	



# MacBook Pro (13-inch, 15-inch, Mid 2012): Will Not Start Up

## Unlikely causes:

Battery, bottom case, fans, heat sink, MagSafe board, optical drive, power adapter, top case

## Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"><li>No startup chime or POST (Power On Self-Test).</li><li>Gray screen appears during startup.</li><li>Some video activity, Apple logo, spinning gear.</li><li>Prohibitory sign or folder with a flashing question mark.</li><li>Startup chime or error beep tones.</li><li>Audible fan, hard drive spin, or optical drive reset sounds.</li><li>Sleep LED on, blinking, or went out.</li><li>Caps Lock LED toggles on and off when pressed.</li></ul> <p><b>Note:</b> Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article <a href="#">OP14: SERVICE: Determining and Quoting Accidental Damage</a>.</p>	<ol style="list-style-type: none"><li>Verify startup process passes initial memory checks and POST (Power On Self-Test) with no beeping sounds or flashing sleep LED. Check video activity.</li><li>Disconnect any peripherals and Ethernet cable.</li><li>Reset SMC using the procedure for this computer in Apple Support article <a href="#">HT3964: Intel-based Macs: Resetting the System Management Controller (SMC)</a>.</li><li>Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.</li><li>Start up from known-good original system media or an up-to-date, bootable Mac OS X volume.</li><li>Run Disk Utility or check Mac Resource Inspector (MRI) results to verify SMART status of the user's hard drive. Check Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> to make sure system build is correct for this computer model.</li></ol>

## Deep Dive

	Check	Result	Action	Code	Commodity
1.	Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.	Yes	Go to step 2.		
	A memory error is indicated if the sleep LED blinks in a sequence of one or three flashes accompanied by the same number of beep tones.  Refer to Apple Support articles <a href="#">HT1547: Power On Self-Test Beep Definition</a> – Part 2 and <a href="#">HT2341: Intel-based Mac Power On Self-Test RAM error codes</a> for more information on LED behaviors and definitions.  Do flashing sleep LEDs or beep tones indicate a memory error?	No	Go to step 6.		
2.	Reseat both memory modules securely in their slots.	Yes	Go to step 3.		
	Does computer indicate a memory error?	No	Issue resolved. Verify resolution.		
3.	Remove user's memory module from the top memory slot on logic board and substitute a known-good memory module.	Yes	Go to step 4.		
	Does computer indicate a memory error with one known-good module and one user module?	No	Replace defective memory. Verify issue resolved.	X02	MEMORY


	Check	Result	Action	Code	Commodity
4.	Keep known-good memory module in top slot and substitute the bottom slot module with a second known-good memory module.	Yes	Replace logic board. Verify issue resolved.	M07	MLB
	Does computer indicate a memory error using two known-good memory modules?	No	Go to step 5.		
5.	Install first user memory module in top slot and test with a known-good memory module in the bottom slot.	Yes	Replace both memory modules. Verify issue resolved.	X02	MEMORY
	Does computer indicate a memory error?	No	Replace defective memory. Verify issue resolved.	X02	MEMORY
6.	Observe startup to verify if boot process displays initial gray screen after the startup sound.	Yes	Go to step 7.		
	Does computer reach a gray screen during the startup process?	No	Go to "Power but Blank/No Video" troubleshooting flow.		
7.	Verify computer completes startup process:	Yes	Issue resolved. Verify resolution.		
	startup sound > gray screen > Apple logo > spinning gear > login screen > user's desktop.	No	Go to step 8.		
8.	Does computer complete startup process to user's desktop?				
	Start up computer and determine if a kernel panic is occurring. Refer to <a href="#">TS3742: About "You need to restart your computer" (kernel panic) message appears (Mac OS X v10.5, 10.6)</a> .	Yes	Go to "Kernel Panic / System Crashes" troubleshooting flow.		
9.	Does computer display a kernel panic during startup?	No	Go to step 9.		
	Start up computer using known-good original system media or an up-to-date, bootable OS X volume.	Yes	Go to step 10.		
9.	During startup, allow 4 minutes for a defective hard drive to time out, after which the computer will start up from the known-good external device.				
	Make sure trackpad is connected to the logic board. The trackpad controller function is shared between devices on the logic board and the trackpad. System startup will hang if the trackpad is removed before the AirPort/Bluetooth cable is removed.	No	Go to step 13.		
	Does computer start up from known-good OS?				


	Check	Result	Action	Code	Commodity
10.	Use Disk Utility, Apple Service Diagnostic (ASD), or Mac Resource Inspector (MRI) to determine if user's hard drive is recognized, and SMART status is verified.  Is user's hard drive detected and SMART status verified?	Yes	Go to step 11.		
		No	Go to "Hard Drive Not Recognized / Not Mounting / Read-Write Issues" troubleshooting flow.		
11.	Refer to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> and use Disk Utility or MRI to determine if the user's hard drive has the correct version and build of OS X.  Is correct version and build of OS X installed on user's hard drive?	Yes	Go to step 12.		
		No	Restore correct version and build of OS X according to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> . Verify issue resolved.		
12.	Run Disk Utility from external volume to repair user's hard drive.  Attempt to start up from user's hard drive.  Does computer start up successfully from user's hard drive?	Yes	Issue resolved. Verify resolution.		
		No	Restore correct version and build of OS X according to Apple Support article <a href="#">HT1159: Mac OS X versions (builds) for computers</a> . Verify issue resolved.		
13.	Disconnect user's hard drive and cable from logic board. Start up computer using known-good original system media or an up-to-date, bootable OS X volume.  Does computer start up from known-good volume?	Yes	Go to step 14.		
		No	Go to step 18.		
14.	To troubleshoot this issue completely, a known-good hard drive is required.  Do you have immediate access to a known-good hard drive?	Yes	Go to step 15.		
		No	Go to step 16.		
15.	Substitute a known-good hard drive with the correct version of OS X, connecting hard drive to logic board with user's hard drive cable.  Does computer start up with known-good hard drive and user's hard drive cable?	Yes	Go to step 43.		
		No	Replace hard drive cable. Reinstall user's hard drive. Verify issue resolved.	X03	
16.	To troubleshoot this issue completely, a known-good hard drive cable is required.  Do you have immediate access to a known-good hard drive cable?	Yes	Go to step 17.		
		No	Go to step 43.		
17.	Substitute a known-good hard drive cable between user's drive and logic board.  Does computer start up with known-good hard drive cable and user's hard drive?	Yes	Replace hard drive cable. Reinstall user's hard drive. Verify issue resolved.	X03	
		No	Go to step 44.		

	Check	Result	Action	Code	Commodity
18.	Issue may be related to AirPort card connection.	Combo AirPort/Bluetooth Card	Go to step 19.		
	<p>Depending on model, the computer will have one of the following:</p> <ul style="list-style-type: none"> <li>• <b>AirPort/Bluetooth combo card</b> (located on edge of optical drive)</li> <li>• <b>AirPort card in display clamshell</b> (located in hinge barrel connected to logic board via camera cable)</li> </ul> <p>Identify which model you are currently troubleshooting.</p> <p>Does computer have combo AirPort/Bluetooth card, or is AirPort card located in display clamshell?</p>	AirPort Card in Display Clamshell	Go to step 30.		
19.	Disconnect AirPort/Bluetooth cable from logic board.	Yes	Go to step 23.		
	<p>Start up computer using known-good original system media or an up-to-date, bootable OS X volume.</p> <p>Does computer start up from known-good volume?</p>	No	Go to step 20.		
20.	Disconnect trackpad cable from logic board.	Yes	Go to step 21.		
	<p>Start up computer using known-good original system media or an up-to-date, bootable OS X volume.</p> <p>Does computer start up from known-good volume?</p>	No	Replace logic board. Verify issue resolved.	M02	MLB
21.	To troubleshoot this issue completely, a known-good trackpad is required.	Yes	Go to step 22.		
	Do you have immediate access to a known-good trackpad?	No	Replace trackpad. Verify issue resolved.	K15	OTHER ELECTRIC
22.	Substitute a known-good trackpad and startup computer using known-good original system media or an up-to-date, bootable OS X volume	Yes	Replace trackpad. Verify issue resolved.	K15	OTHER ELECTRIC
	Does computer start up with known-good trackpad installed?	No	Replace logic board. Verify issue resolved.	M02	MLB


	Check	Result	Action	Code	Commodity
23.	Inspect AirPort/Bluetooth cable for damage.	Yes	Replace AirPort/Bluetooth flex cable. Verify issue resolved.	X03	INTERNAL CABLE
	If present, peel back conductive wrap covering flex cable on AirPort/Bluetooth card side. Check connectors on both ends of cable for bent pins, loose wires, or cracked housing. Check cable for pinching or crimping.	No	Go to step 24.		
24.	Is AirPort/Bluetooth flex cable or its connectors damaged?				
	Inspect AirPort/Bluetooth cable connector on logic board for bent pins or housing damage.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
25.	Is logic board connector damaged?	No	Go to step 25.		
	Inspect cable connector port on AirPort/Bluetooth card for pin or housing damage.	Yes	Replace AirPort/Bluetooth card. Verify issue resolved.	N13	WIRELESS DEVICE
26.	Is AirPort/Bluetooth card connector damaged?	No	Go to step 26.		
	Inspect and reseat AirPort/Bluetooth flex cable to both the logic board and the AirPort/Bluetooth card. If present, reapply conductive wrap covering flex cable on AirPort/Bluetooth card side.	Yes	Go to step 27.		
27.	Start up computer from known-good original system media or an up-to-date, bootable OS X volume.	No	Issue resolved. Verify resolution.		
	Does no-startup issue persist?				
28.	To troubleshoot this issue completely, the following known-good parts are required:	Yes	Go to step 28.		
	<ul style="list-style-type: none"> <li>AirPort/Bluetooth card</li> <li>AirPort/Bluetooth flex cable</li> </ul>	No	Replace AirPort/Bluetooth card. Verify issue resolved.	N13	WIRELESS DEVICE
29.	Do you have immediate access to each of these known-good parts?				
	Substitute a known-good AirPort/Bluetooth flex cable.	Yes	Go to step 29.		
30.	Start up computer using known-good original system media or an up-to-date, bootable OS X volume.	No	Replace AirPort/Bluetooth flex cable. Verify issue resolved.	X03	INTERNAL CABLE
	Verify Wi-Fi (AirPort) and Bluetooth are present.				
31.	Does no-startup issue persist?				

	Check	Result	Action	Code	Commodity
29.	Continue using known-good flex cable. Substitute a known-good AirPort/Bluetooth card.	Yes	Replace logic board. Verify issue resolved.	M02	MLB
	Start up computer using known-good original system media or an up-to-date, bootable OS X volume.	No	Replace AirPort/Bluetooth card. Verify issue resolved.	N13	WIRELESS DEVICE
	Verify Wi-Fi (AirPort) and Bluetooth are present.				
	Does no-startup issue persist?				
30.	Disconnect camera cable from logic board.	Yes	Go to step 34.		
	Start up computer using known-good original system media or an up-to-date, bootable OS X volume.	No	Go to step 31.		
	Does computer start up from known-good volume?				
31.	Disconnect trackpad cable from logic board.	Yes	Go to step 32.		
	Start up computer using known-good original system media or an up-to-date, bootable OS X volume.	No	Replace logic board. Verify issue resolved.	M02	MLB
	Does computer start up from known-good volume?				
32.	To troubleshoot this issue completely, a known-good trackpad is required.	Yes	Go to step 33.		
	Do you have immediate access to a known-good trackpad?	No	Replace trackpad. Verify issue resolved.	K15	OTHER ELECTRIC
33.	Substitute a known-good trackpad and start up the computer using known-good original system media or an up-to-date, bootable OS X volume	Yes	Replace trackpad. Verify issue resolved.	K15	OTHER ELECTRIC
	Does computer start up with known-good trackpad installed?	No	Replace logic board. Verify issue resolved.	M02	MLB
34.	To troubleshoot this issue completely, the following known-good parts are required:	Yes	Go to step 39.		
	<ul style="list-style-type: none"> <li>• Display clamshell</li> <li>• AirPort card (installed in clamshell)</li> </ul>	No	Go to step 35.		
	Do you have immediate access to a known-good display clamshell?				

	Check	Result	Action	Code	Commodity
35.	Remove user's display clamshell from computer. Remove hinge barrel and disconnect cable connector from AirPort card to determine if user's AirPort card is affecting the startup process.	Yes	Go to step 36.		
	Reinstall display clamshell and reconnect LVDS and camera cables to logic board.  Start up computer using known-good original system media or an up-to-date, bootable OS X volume.  Does computer start up from known-good volume?	No	Replace display clamshell. Verify issue resolved.	L23	LCD
36.	As long as AirPort card is disconnected, Wi-Fi should be disabled. Verify camera and Bluetooth are enabled and functional.	Yes	Go to step 37.		
	Are camera and Bluetooth present and functional?	No	Replace display clamshell. Verify issue resolved.	L23	LCD
37.	To troubleshoot this issue completely, a known-good AirPort card is required.	Yes	Go to step 38.		
	Do you have immediate access to a known-good AirPort card?	No	Replace AirPort card. Verify issue resolved.	N13	WIRELESS DEVICE
38.	Install a known-good AirPort card.  Start up computer using known-good original system media or an up-to-date, bootable OS X volume.  Does computer start up from known-good volume and are camera, Bluetooth and Wi-Fi (AirPort) present?	Yes	Replace AirPort card. Verify issue resolved.	N13	WIRELESS DEVICE
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>The logic board may have been damaged by user clamshell cable damage or reversed AirPort card connection, requiring guidance and careful inspection so as to not to damage the logic board replacement.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	

	Check	Result	Action	Code	Commodity
39.	Disconnect camera cable from logic board and connect a known-good display clamshell camera cable.	Yes	Go to step 40.		
	Start up computer using known-good original system media or an up-to-date, bootable OS X volume.  Does computer start up from known-good volume with known-good clamshell camera cable connected?	No	Replace logic board. Verify issue resolved.	M02	MLB
40.	Verify if camera, Bluetooth and Wi-Fi (AirPort) are present and functional.  Are camera, Bluetooth and Wi-Fi (AirPort) present and functional?	Yes	Go to step 41.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>The logic board may have been damaged by user clamshell cable damage or reversed AirPort card connection, requiring guidance and careful inspection so as to not to damage the logic board replacement.</p> <p>Click the Help button in the GSX toolbar. Select Troubleshooting &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
41.	Disconnect known-good display clamshell camera cable from logic board.	Yes	Replace AirPort card. Verify issue resolved.	N13	WIRELESS DEVICE
	Remove user's display clamshell from computer. Remove hinge barrel and disconnect cable connector from AirPort card to determine if user's AirPort card is affecting startup process.  Reinstall user's display clamshell. Reconnect LVDS and camera cables to logic board.  Start up computer using known-good original system media or an up-to-date, bootable OS X volume.  Does computer start up from known-good volume?	No	Replace display clamshell. Verify issue resolved.	L23	LCD



	Check	Result	Action	Code	Commodity
42.	<p>Confirm that the computer starts up and restarts successfully over several trials.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p><b>ESCALATION REQUIRED.</b></p> <p>Contact TSPS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar &gt; Technical Help with a Repair &gt; Contact Apple.</p>	M99	
43.	<p>Identify the type of storage device affected:</p> <ul style="list-style-type: none"> <li>• Hard Disk Drive (HDD)</li> <li>• Flash Storage / Solid-State Drive (SSD)</li> </ul> <p>Is the affected device an HDD or SSD?</p>	HDD	Replace the user's hard drive. Verify issue resolved.	H02	HDD
		SSD	Replace the user's flash storage / SSD. Verify issue resolved.	H02	SSD
44.	<p>Identify the type of storage device affected:</p> <ul style="list-style-type: none"> <li>• Hard Disk Drive (HDD)</li> <li>• Flash Storage / Solid-State Drive (SSD)</li> </ul> <p>Is the affected device an HDD or SSD?</p>	HDD	Replace the user's hard drive. Reinstall the user's hard drive cable. Verify issue resolved.	H02	HDD
		SSD	Replace the user's flash storage / SSD. Reinstall the user's SSD cable. Verify issue resolved.	H02	SSD

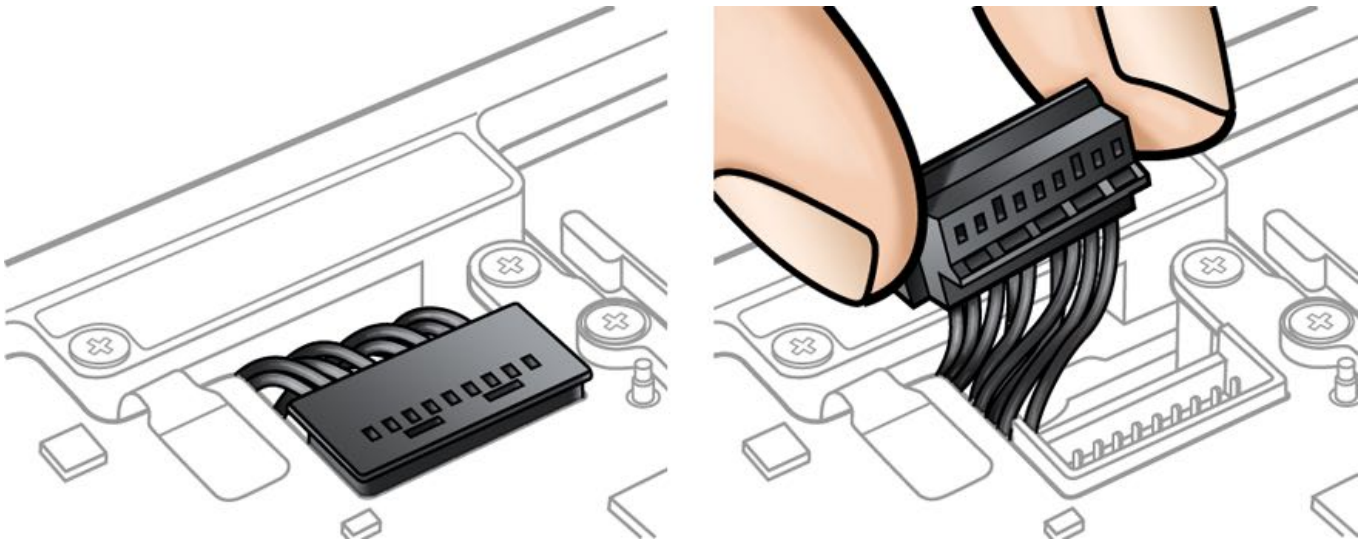
# MacBook Pro (13-inch, Mid 2009, Mid 2010, Early / Late 2011, Mid 2012): Connector Types on Logic Board

On the logic board are five types of connectors, each requiring special handling. Make sure you read these tips before disconnecting and installing the connectors.

## Battery Connector

- Use black stick or fingernails to pull up evenly on sides of connector.
- Align connector over pins and press onto board when reconnecting.
- Do not pull wires.

[Battery Connector Video](#)



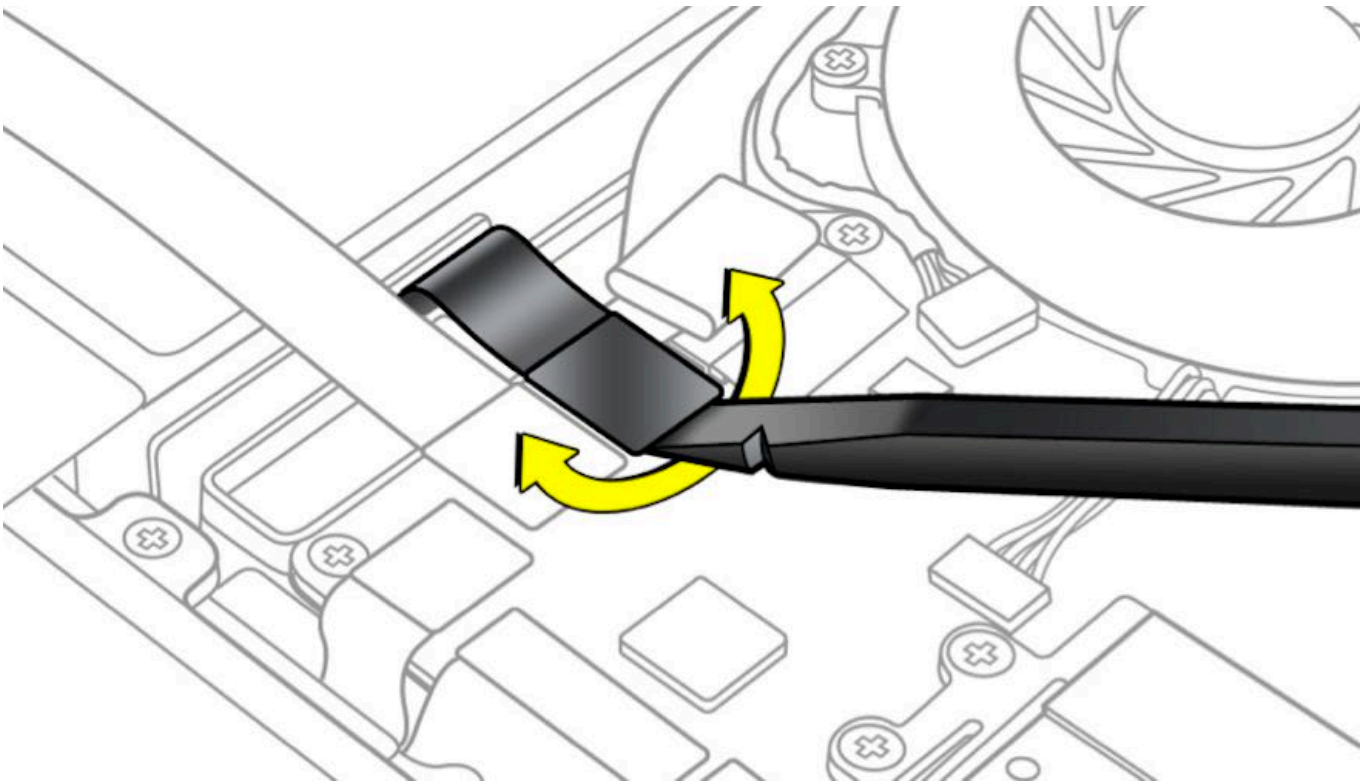
## Low-Profile Solid Platform Flex

- Use black stick and gentle rocking motion to release tension to remove cable.
- Keep connector level with board and press evenly to install cable.

Examples:

- optical drive
- hard drive
- trackpad
- BIL

[Low-Profile Solid Platform Flex Video](#)



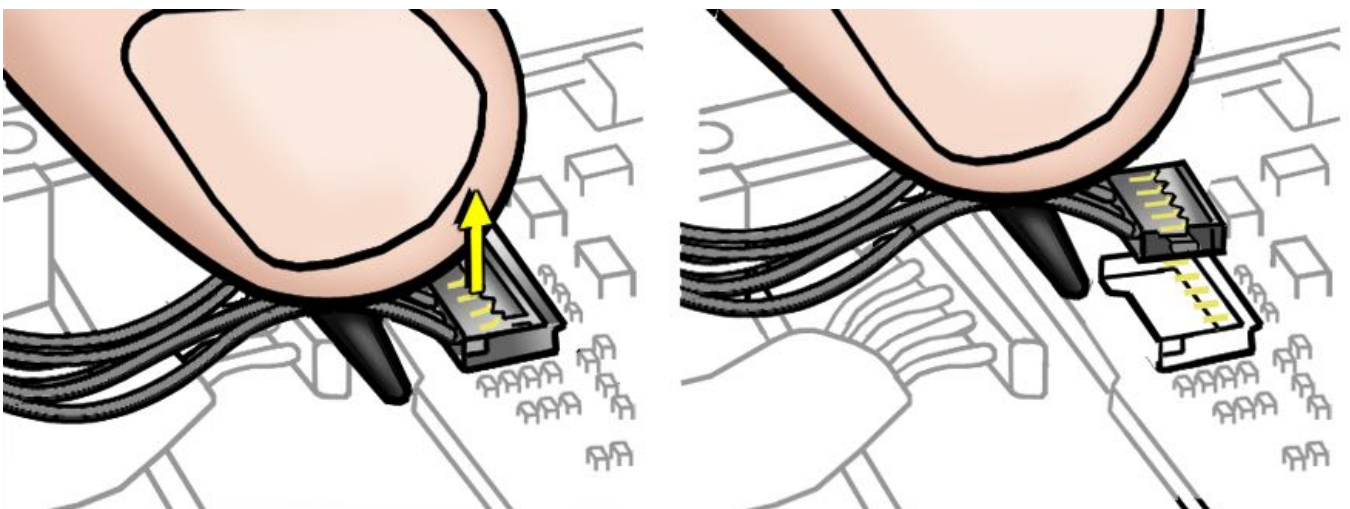
### Vertical Insertion (JST)

- Use black stick under cable to remove.
- Keep connector level with board when disconnecting and reconnecting.
- Press evenly when reconnecting, or connector can be tipped up and not fully seated.

Examples:

- fan
- right speaker
- left speaker
- microphone

[Vertical Insertion \(JST\) Video](#)



### Locking Lever

- Flip lever up 90 degrees for cable removal.

- Slide connector into receptacle. Use tweezers if necessary.
- Lock down lever after inserting cable.
- Close lever when handling or shipping a loose logic board, whether a known-good or a known-bad board.

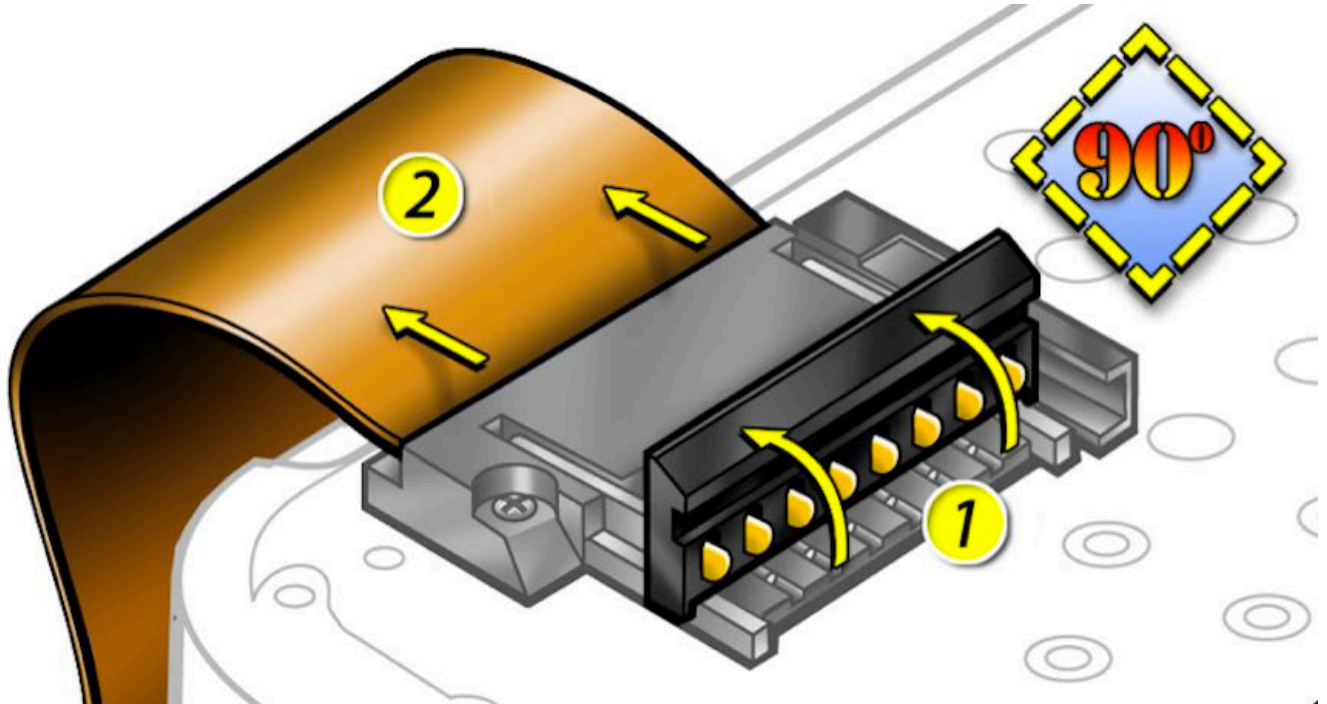
Examples:

- IR/SIL flex cable
- keyboard backlight
- keyboard

[Locking Lever Video](#)



**Caution:** Use black stick to push keyboard flex cable **all the way** into connector to prevent symptom of no power.



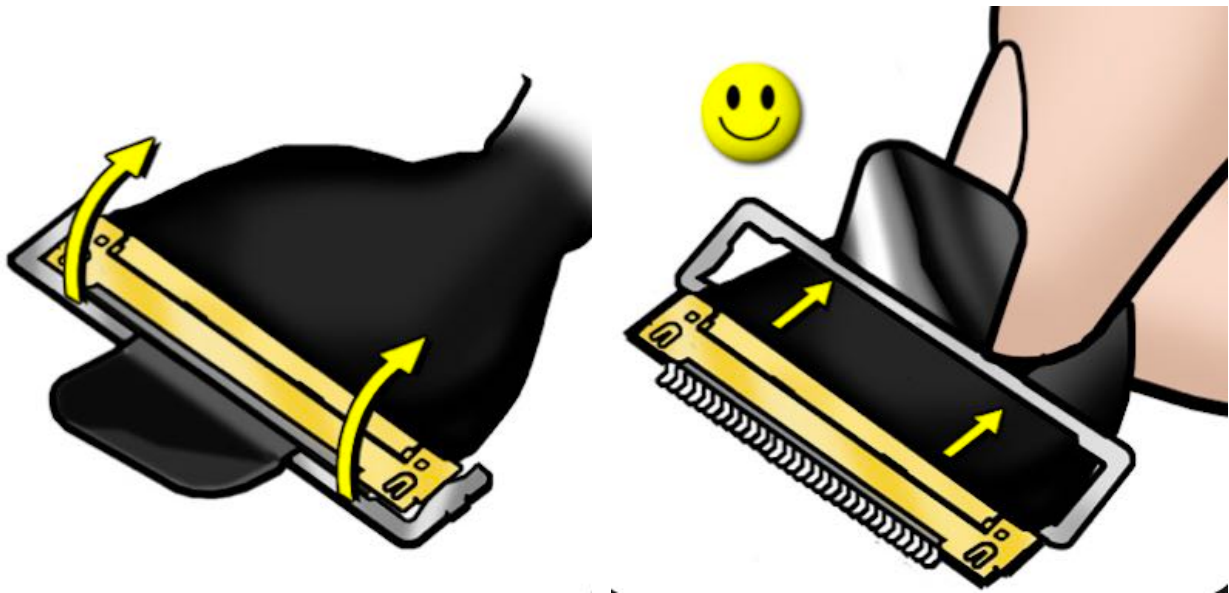
#### Thin, Multi-Pin Horizontal Insert

- Use fingernails or tweezers to remove evenly.
- Slide connector into receptacle on same horizontal plane as board.

Examples shown:

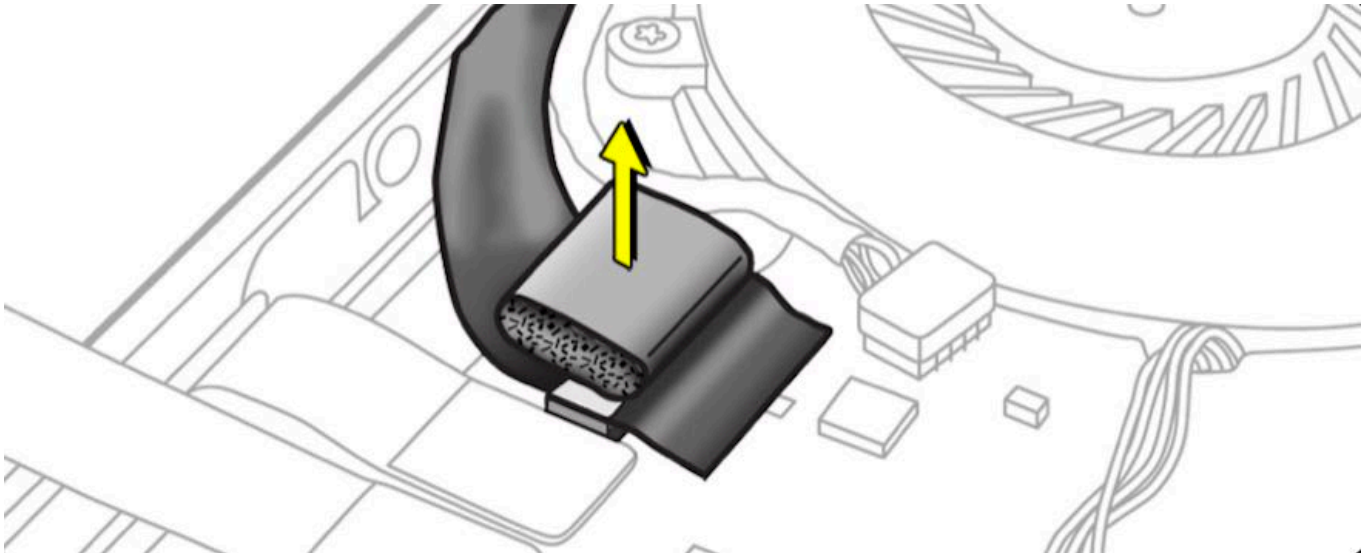
- LVDS cable
- camera cable

[Thin, Multi-Pin Horizontal Insert Video](#)

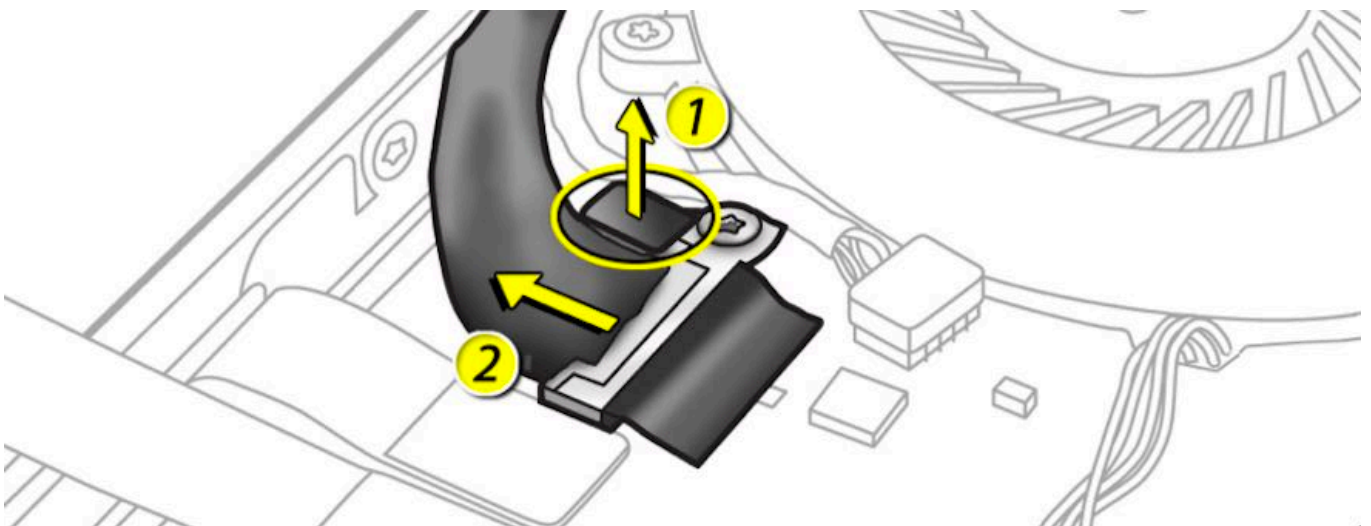


**Caution:** When disconnecting camera cable, remove gasket (922-8752) and shim (922-9450) **before** disconnecting cable.

**Caution:** Avoid touching adhesive side of shim; body oils degrade adhesive.



**Replacement Caution:** To prevent issues of no video or a short to the logic board, be sure to place EMI gasket on camera cable— **positioned precisely where shown**—after cable is fully connected to logic board and shim is in place.





## MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Tools

**Caution:** To prevent scratches or other cosmetic damage to the computer housing, use a soft cloth as a protective layer when removing and installing the external screws.

The following tools are required to service this computer:

- Clean, soft, lint-free cloth
- ESD-safe workstation, including an ESD mat and wrist or heel strap
- ESD bags (for storing ESD-sensitive parts while removed from unit)
- Phillips #00 screwdriver, magnetized
- Torx T6 screwdriver, magnetized
- Torx T8 screwdriver, magnetized
- Large tri-lobe #0 screwdriver (Apple part #922-8991)
- Black stick (nylon probe, Apple part #922-5065) or other nonconductive nylon or plastic flat-blade tool
- EMI-safe plastic or nylon tweezers for installing flex cables (optional)
- Thermal grease syringe (Apple part #922-7144)
- Alcohol wipes
- Kapton tape
- Permanent marking, felt-tip pen
- Pencil with eraser
- Foam wedge fixture for display clamshell removal (Apple part #922-8779)
- Magnifying glass, for reading serial number etched on bottom case
- Digital volt meter (troubleshooting)

For more information about ESD, refer to:

- [OP100: Electrostatic Discharge Precautions and Myths](#)
- [AppleCare Service Training: ESD Precautions](#)

# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): First Steps Chart

Starting at the Parts column, find the part that interests you. Read across that row to see which parts in the First Steps must be removed before performing your part removal steps. ■ = remove part; □ = disconnect cable or partially disconnect part.

		FIRST STEPS																							
		Bottom Case	Battery	Hard Drive/SSD	HD/IR/Sleep Cable	Rear HD Bracket	AP/BT Flex Cable	AP/BT Card and Holder	Right Speaker	Optical Drive	Optical Drive Cable	LVDS Cable Guide	Display	Fan	Memory	Logic Board *	Heat Sink	Left Speaker	MagSafe Board	Microphone	Trackpad	BIL	Center Bracket	Top Case **	
PARTS																									
Bottom Case																									
Battery		■	□																						
Hard Drive/SSD		■	□																						
HD/IR/Sleep Cable		■	□	■		■																			
Rear HD Bracket		■	□																						
AP/BT Flex Cable		■	□																						
AP/BT Card and Holder		■	□																						
Right Speaker		■	□	■	□	■	□	■		■	□														
Optical Drive		■	□		□	■	■	■																	
Optical Drive Cable		■	□		□	■	■	■	■																
LVDS Cable Guide		■	□																						
Display		■	□				■	■	■			■													
Fan		■	□																						
Memory		■	□																						
Logic Board *		■	□		□		□		■		□				■										
Heat Sink		■	□		□		□				□					■	■								
Left Speaker		■	□		□		□				□					■	■								
MagSafe Board		■	□		□		□				□					■	■								
Microphone		■	□		□		□				□	■			■	■	■								
Trackpad		■	■																						
BIL		■	■		□		□		■		□				■	■	■								
Center Bracket		■	□						■	■					■	■	■								
Top Case **		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				

\* If logic board is being replaced by a new logic board, remove and transfer the heat sink, left speaker, and microphone.

\*\* Top case comes with the following: keyboard and BIL,

# Take Apart Procedure Notes

## Reassembly Steps

When no replacement steps are listed, replace parts in exact reverse order of Removal procedure.

## Note About Images in This Guide

In some cases a pre-production model may have been used to document the procedures in this guide. Although there may be small differences in appearance between the image pictured and the computer you are servicing, the procedures are the same unless noted.

## Screw Sizes

All screw sizes shown are approximate and represent the total length of the screw.

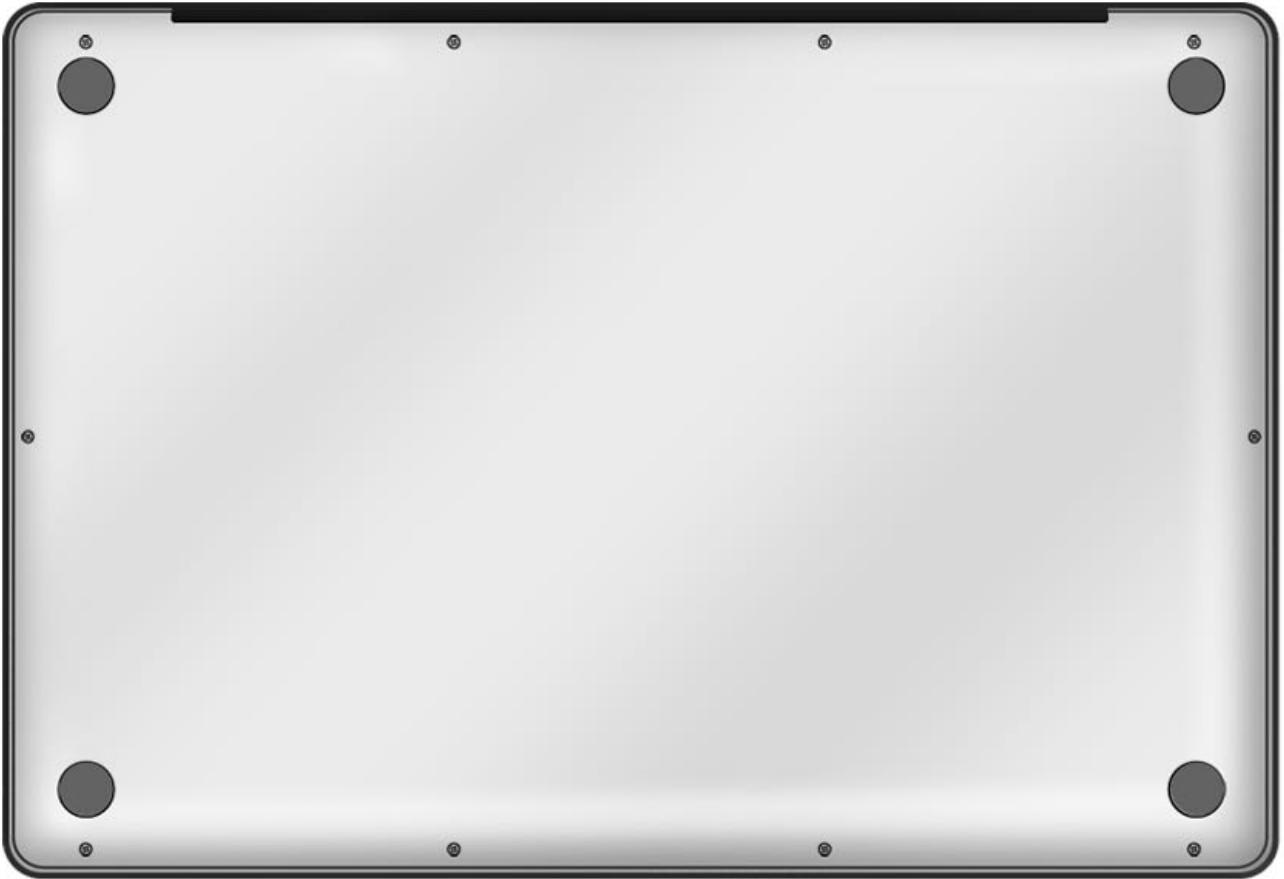




# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Bottom Case

## First Steps

- Shut down computer.
- Unplug all cables.
- Wait 10 minutes
- Put on ESD strap.
- Place computer face down on a clean, flat surface.



## Tools

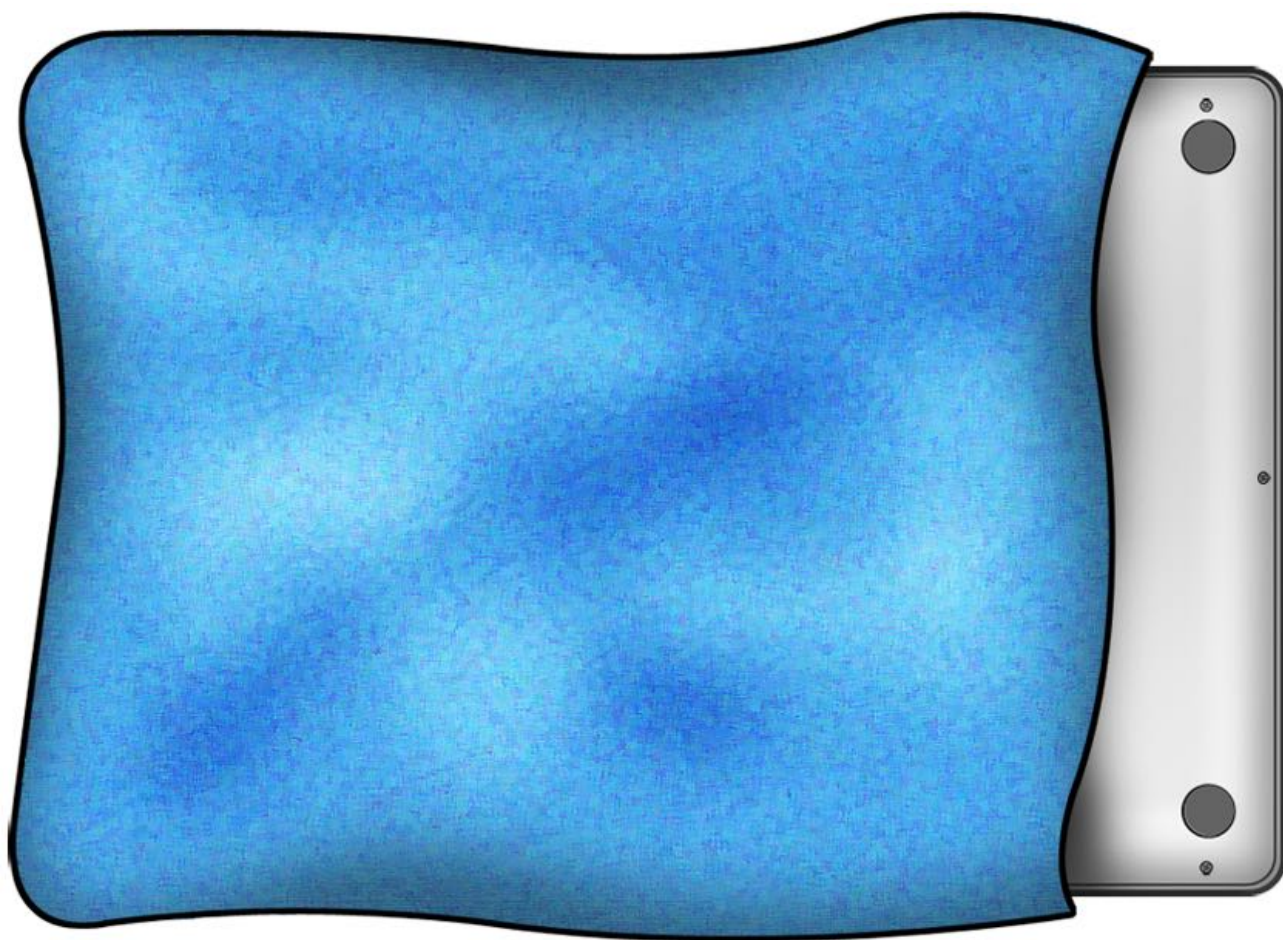
- ESD wrist strap
- Clean, soft, lint-free cloth
- Phillips #00 screwdriver, magnetized
- Black stick
- Magnifying glass



## Steps For Removal



**Caution:** To prevent scratches, use a protective cloth when working with metal tools.



1. Remove Phillips #00 screws:

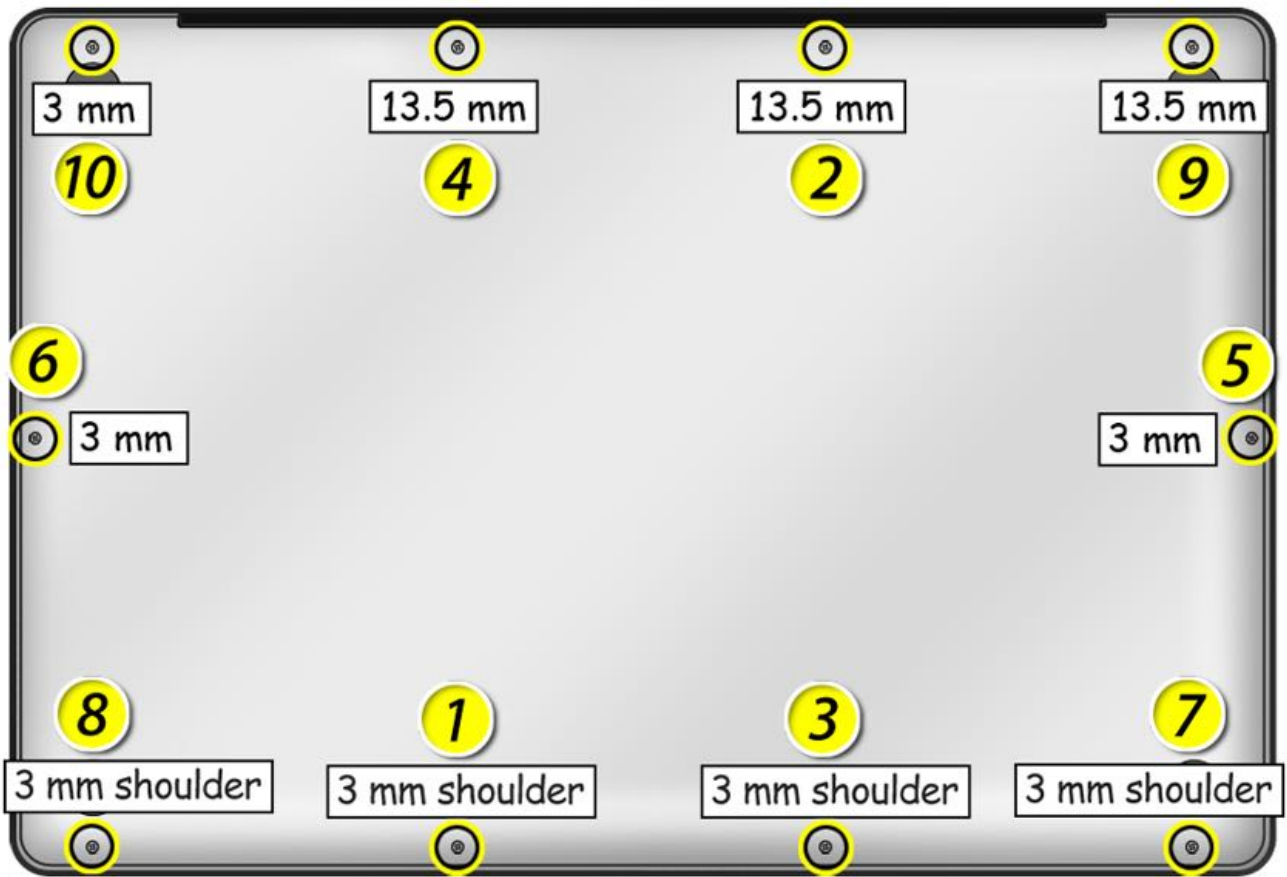
(3) 922-8666 (13.5mm)



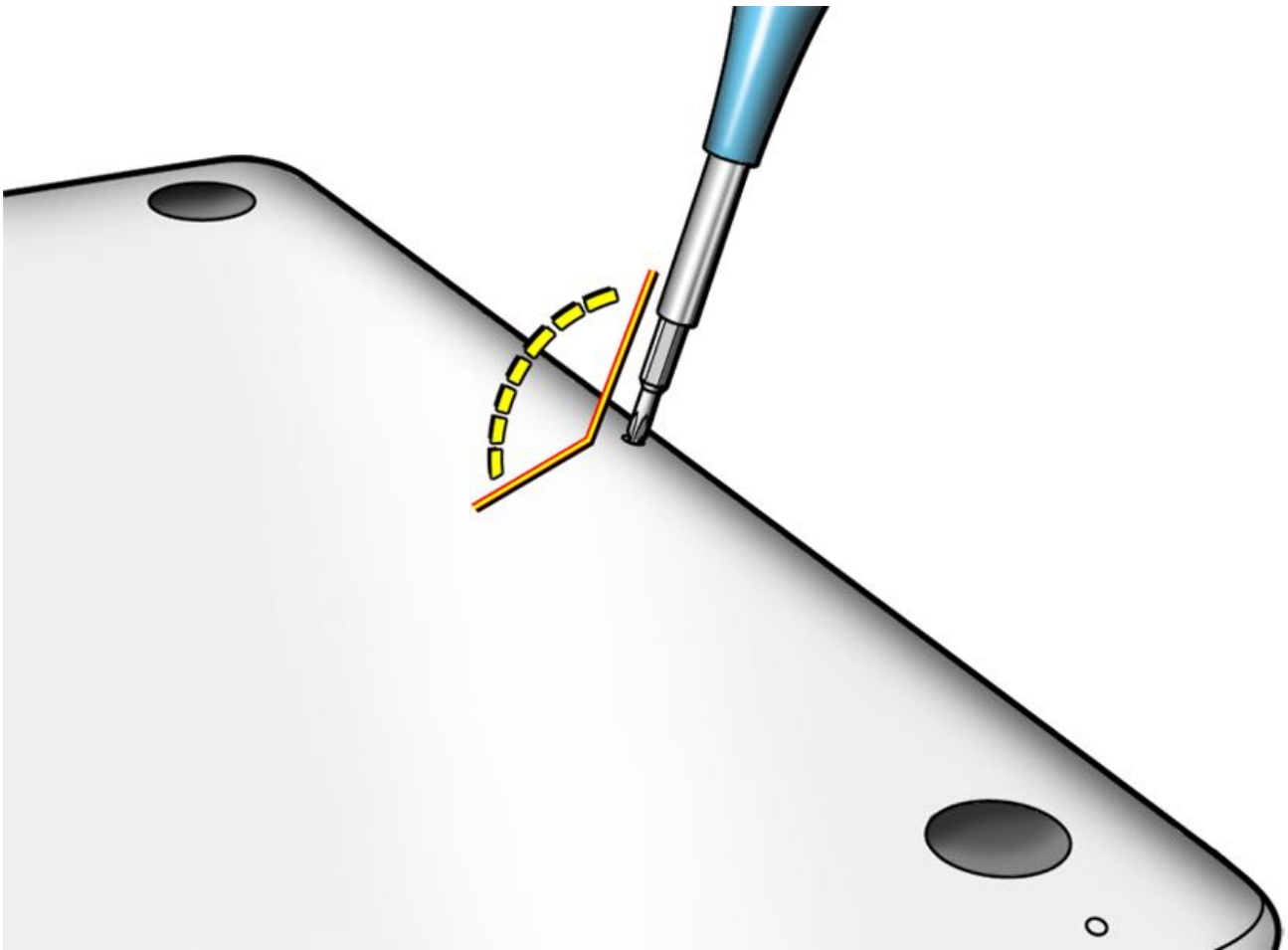
(3) 922-8972 (3mm)



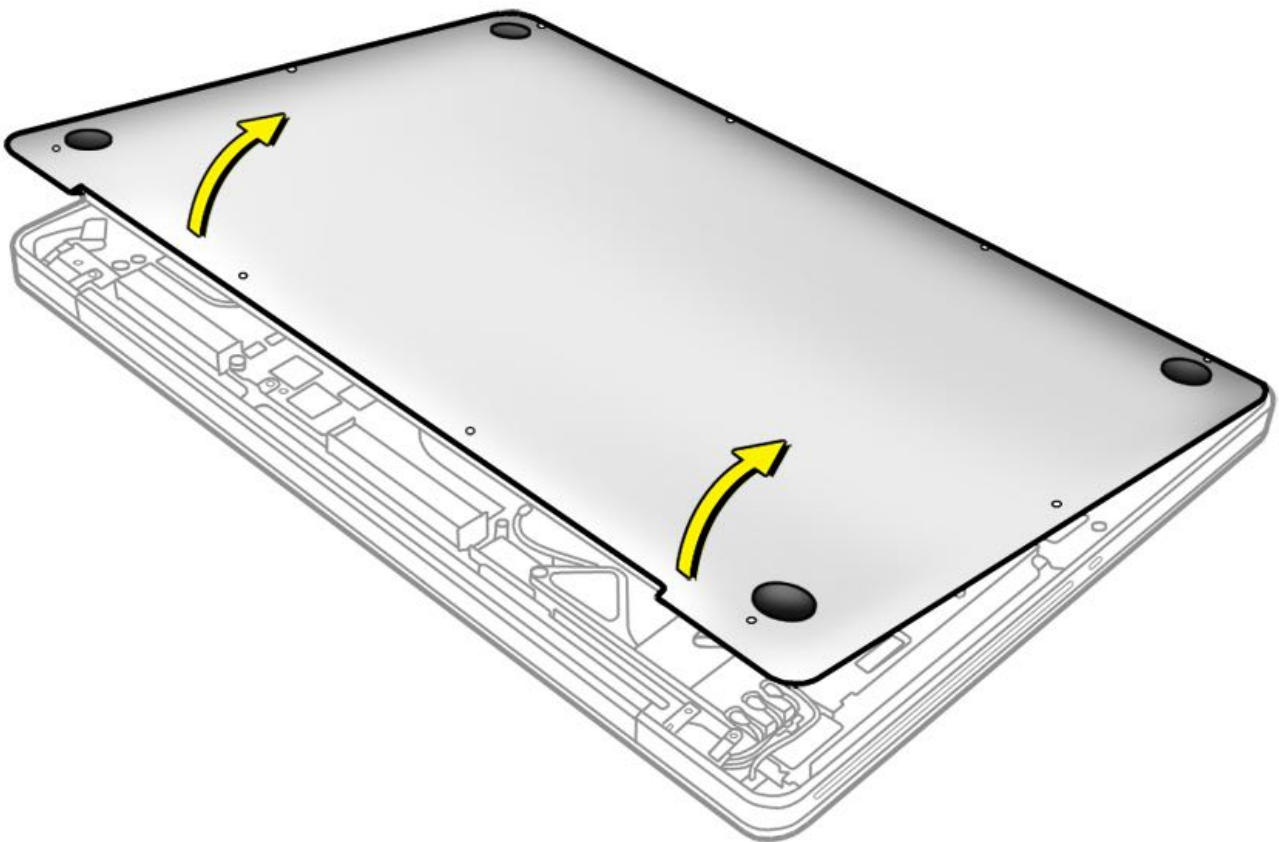
(4) 922-9522 (3mm shoulder)



**Important:** Screws at sides and front of computer must be removed and installed at an angle.

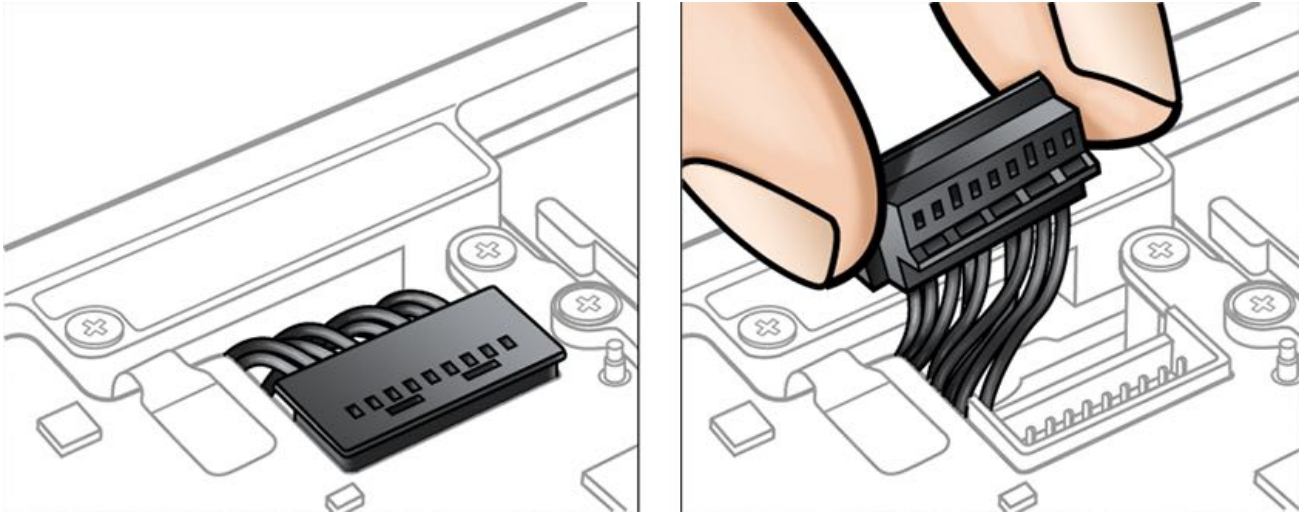


2. Loosen and remove bottom case.



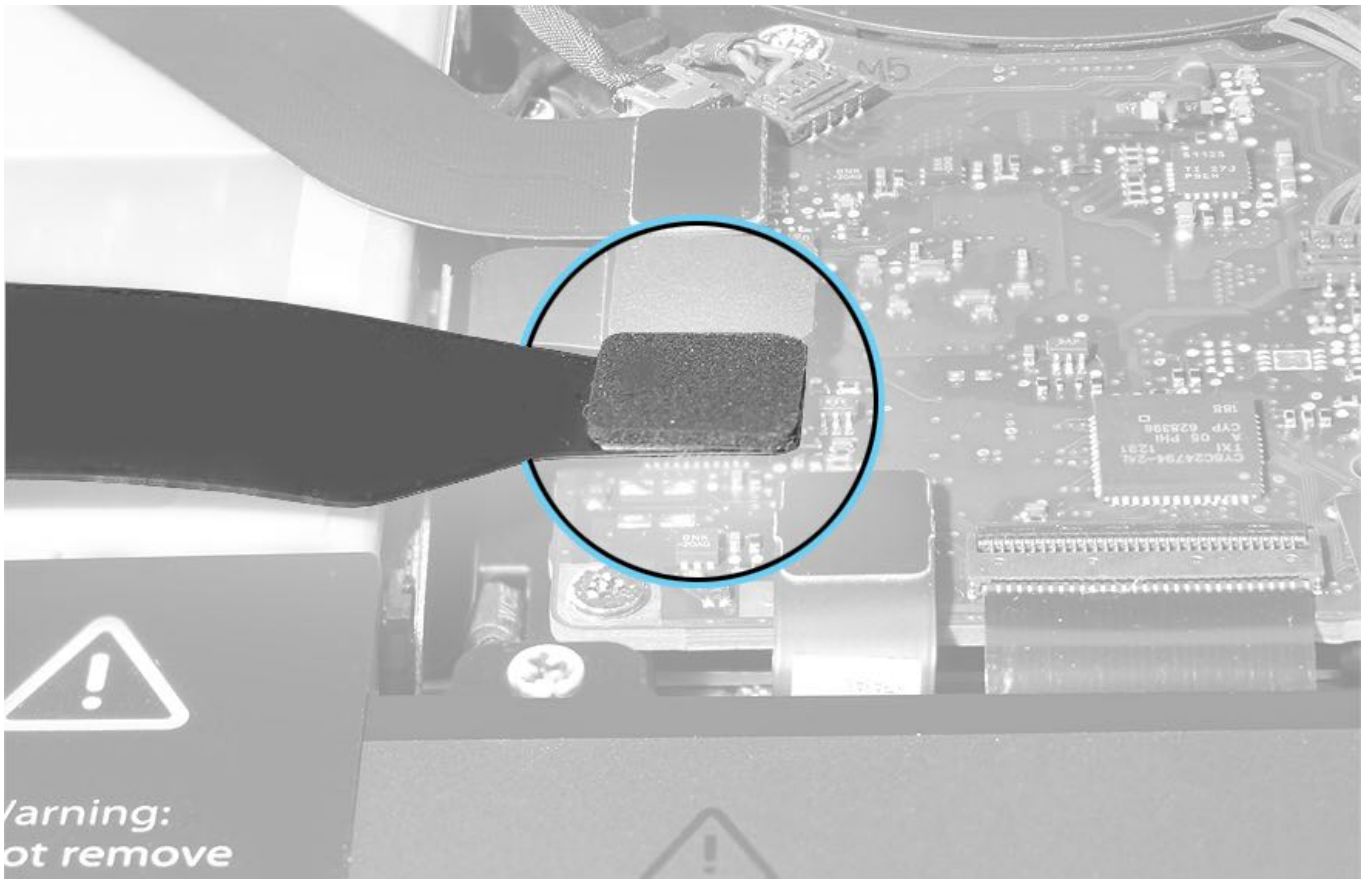
**Warning:** If performing any other repairs, be sure to disconnect battery cable.





#### For Mid 2012 model only:

Check that a foam pad is included on the hard drive flex cable at the logic board side. If it is not included, attach the pad to the cable. Foam pads are available in packages of 10 (923-0002) or packages of 50 (923-0003).

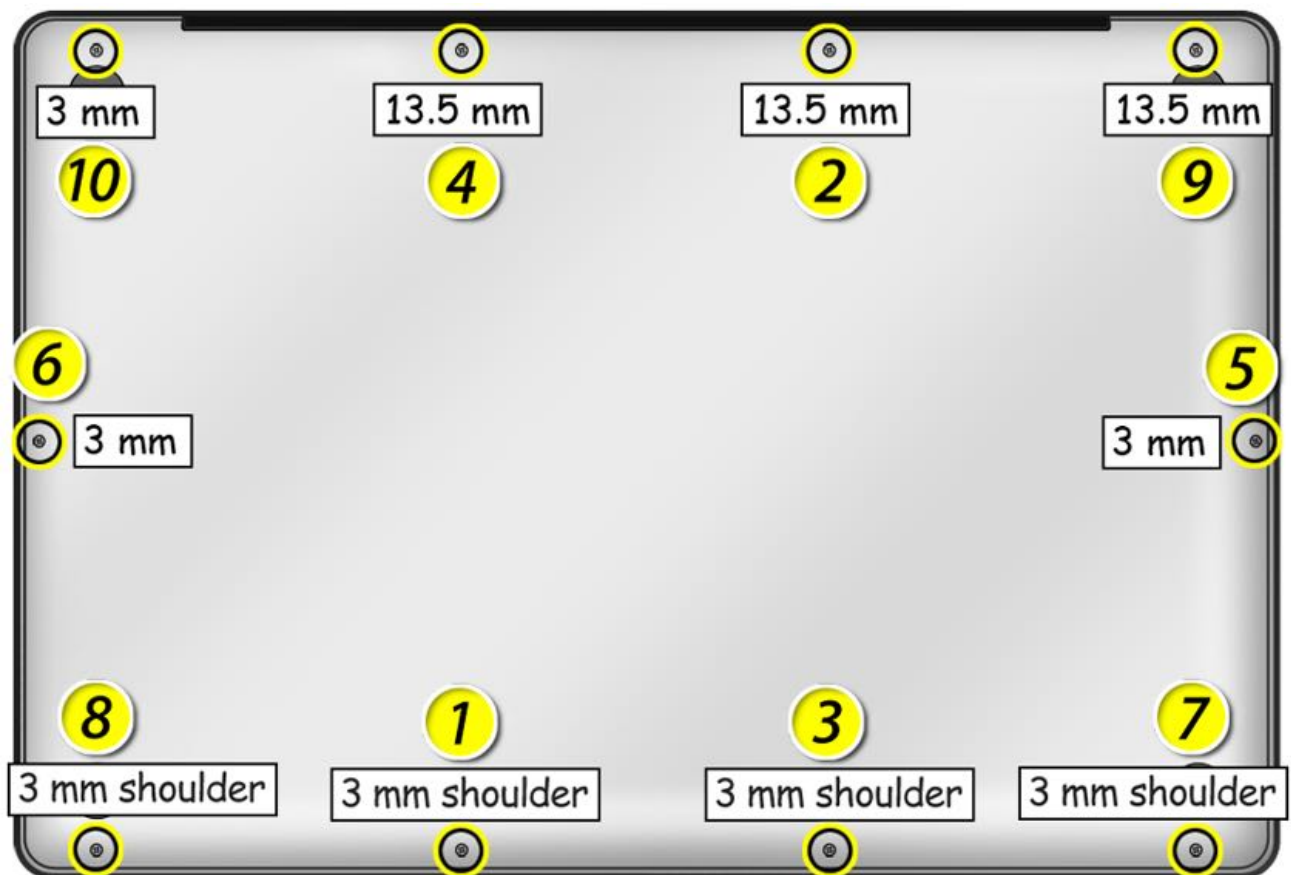


#### Steps For Reassembly

1. When installing a new bottom case, retain original bottom case until repair is complete. Before installing replacement bottom case, write serial number on inside as shown here. You might need a magnifying glass to read serial number on original bottom case.



2. Install screws in order shown. If sequence is not followed, bottom case might wobble when placed on level surface.



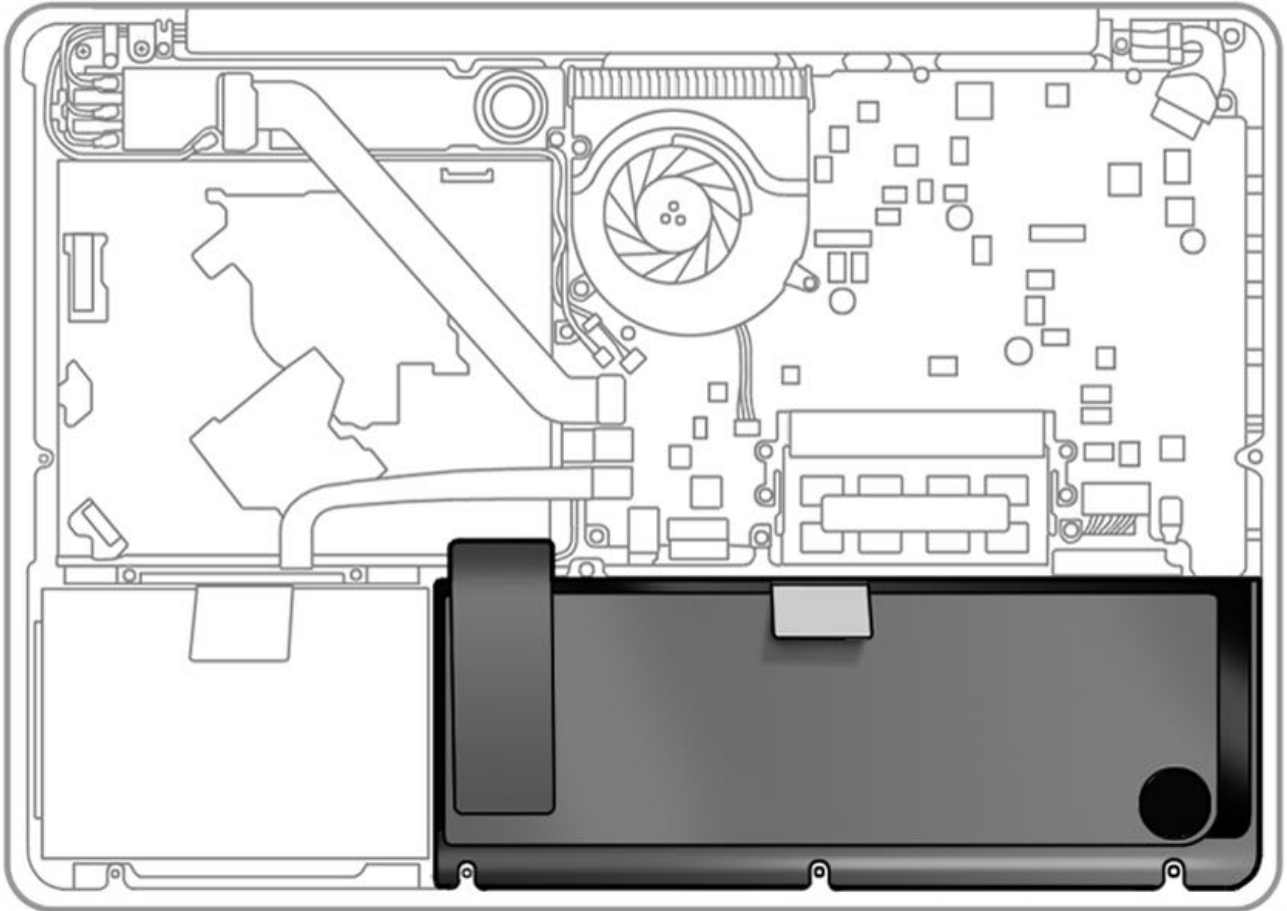
# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Battery

## First Steps

Remove:

- [Bottom Case](#)

**Important:** Battery removal is only required when replacing the battery, BIL, trackpad, or top case. Other internal repairs require disconnecting the battery cable but not removing the battery.



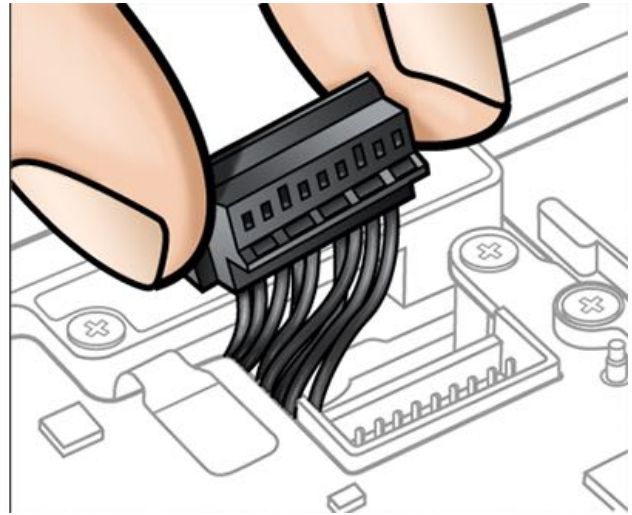
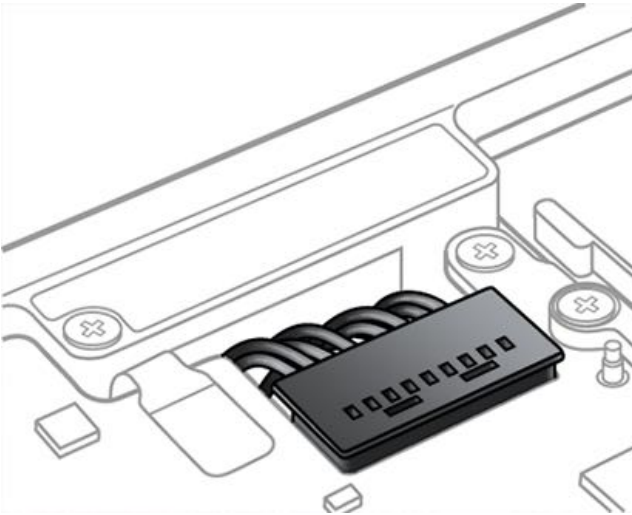
## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Black stick
- Large tri-lobe #0 screwdriver (922-8991)



## Steps For Removal

1. Use black stick or fingernails to evenly disconnect battery cable from logic board.



2. Remove tri-lobe #0 screws:  
(1) 922-9227 (5.5mm)



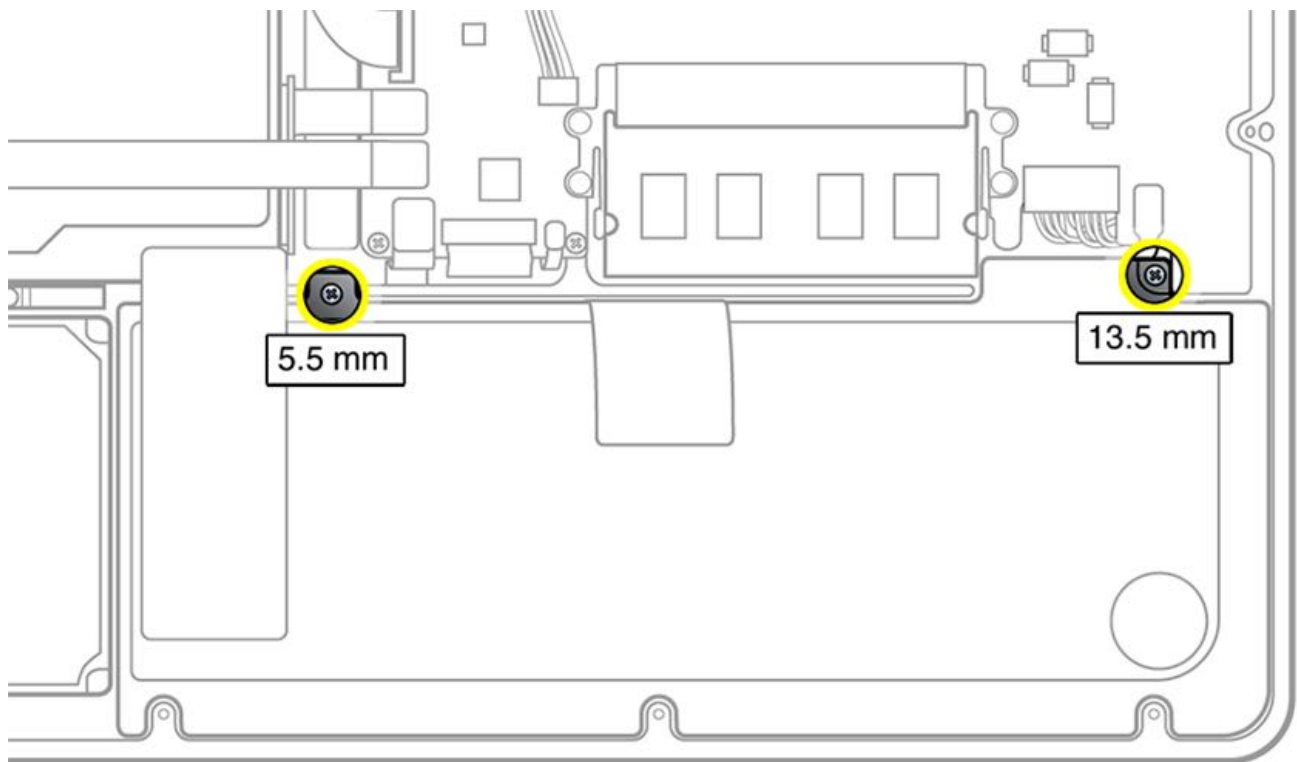
(1) 922-9226 (13.5mm)



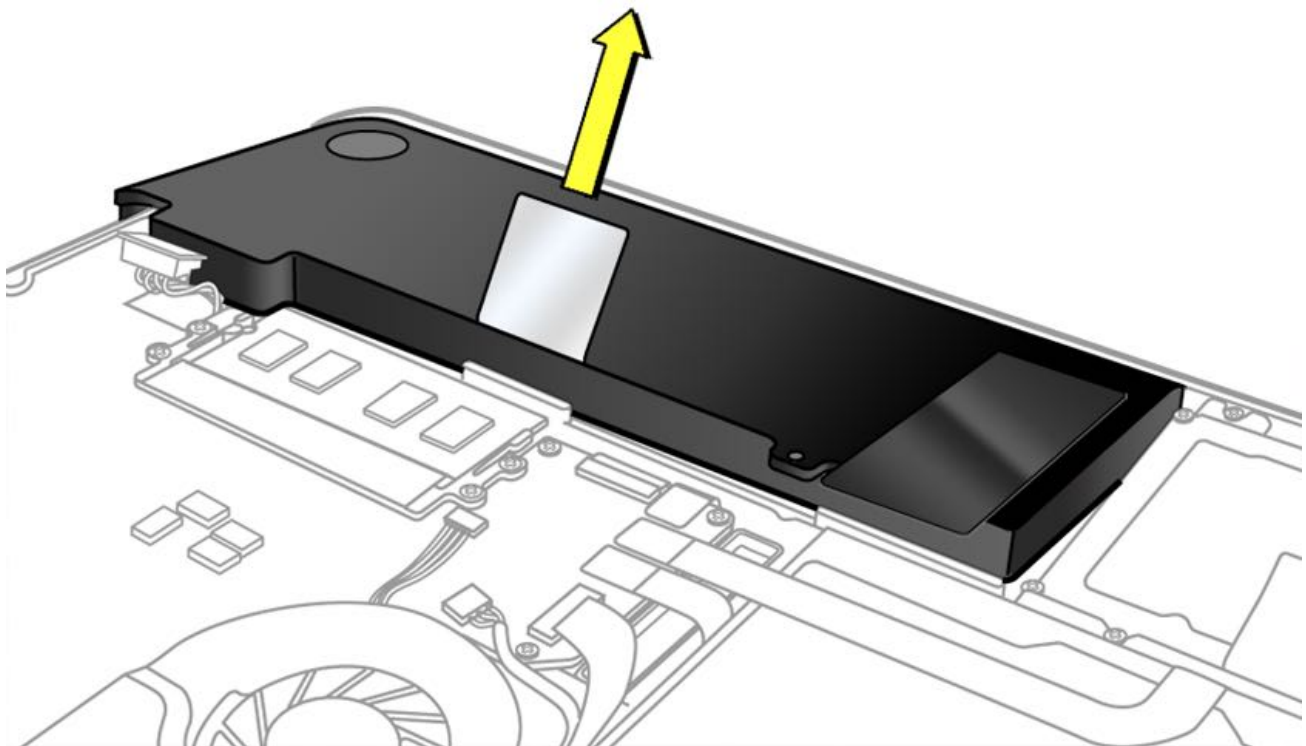
3. Peel up battery warning label from optical drive and midwall only.

If same battery is to be reinstalled, keep warning label attached to battery. (Replacement battery includes new warning label.)





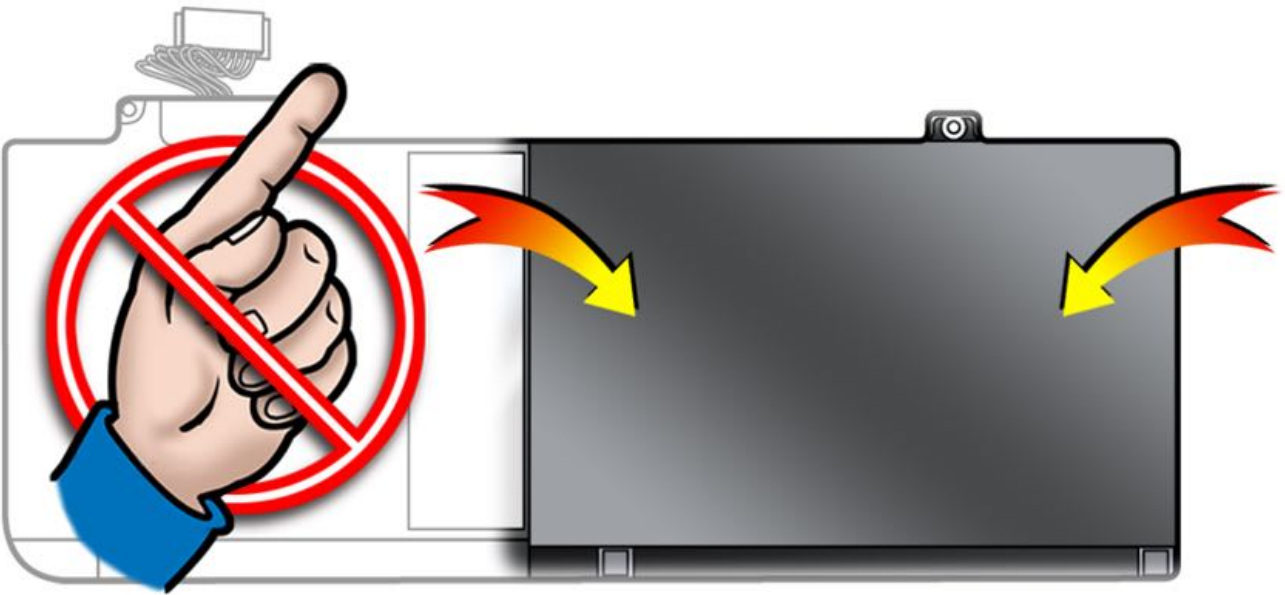
4. Use pull-tab to tilt up battery and remove from top case.



**Warning:** Underside of battery has a nonconductive cover.

- Do not puncture or press on battery.
- Hold battery by edges only.
- If setting battery aside, make sure surface is clean—free of dust, dirt, screws, and so on.

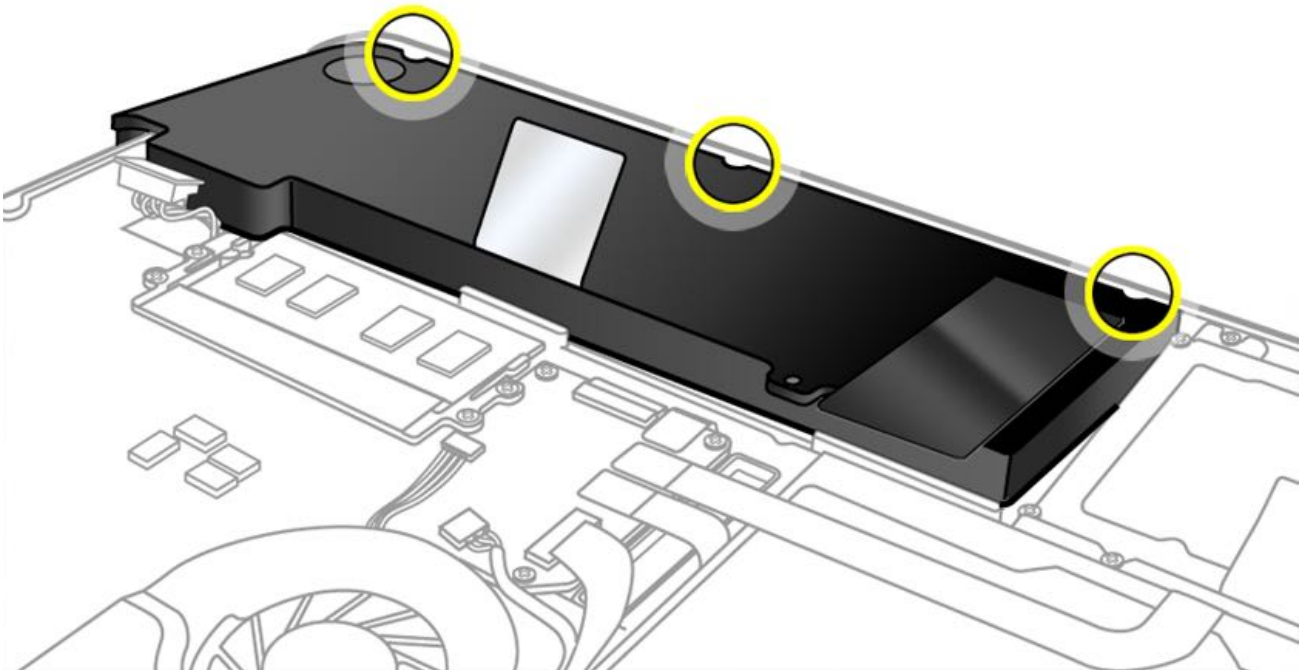
**Warning:** If battery cover is punctured, do not re-use battery.



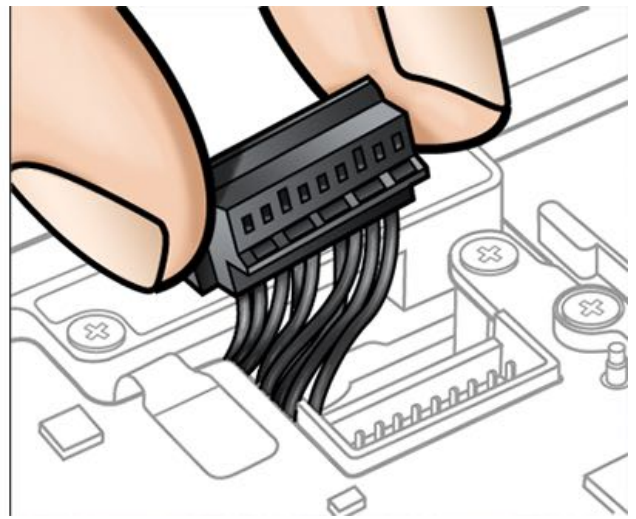
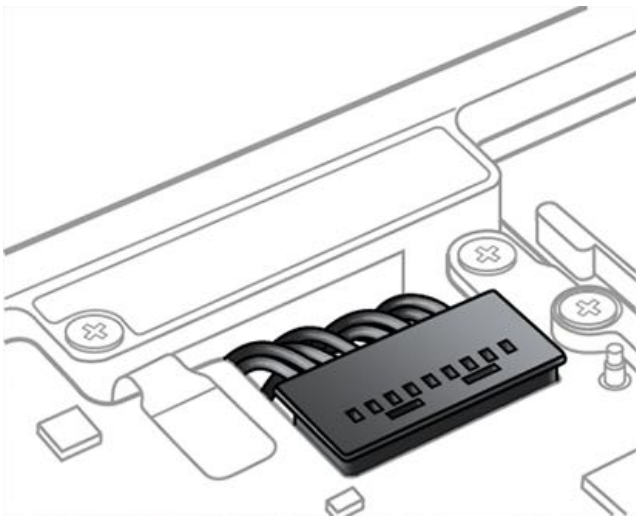
### Steps For Reassembly

1. Slide front edge of battery under 3 tabs.
2. Install 2 screws (longer screw near cable connector).

**Note:** If installing new battery, attach battery warning label (refer to battery in-box instructions).



3. If performing other repairs, be sure to leave battery cable disconnected. Otherwise, align battery connector over pins, connect battery cable to logic board, and reassemble computer.



4. Press battery indicator light to check charge level.

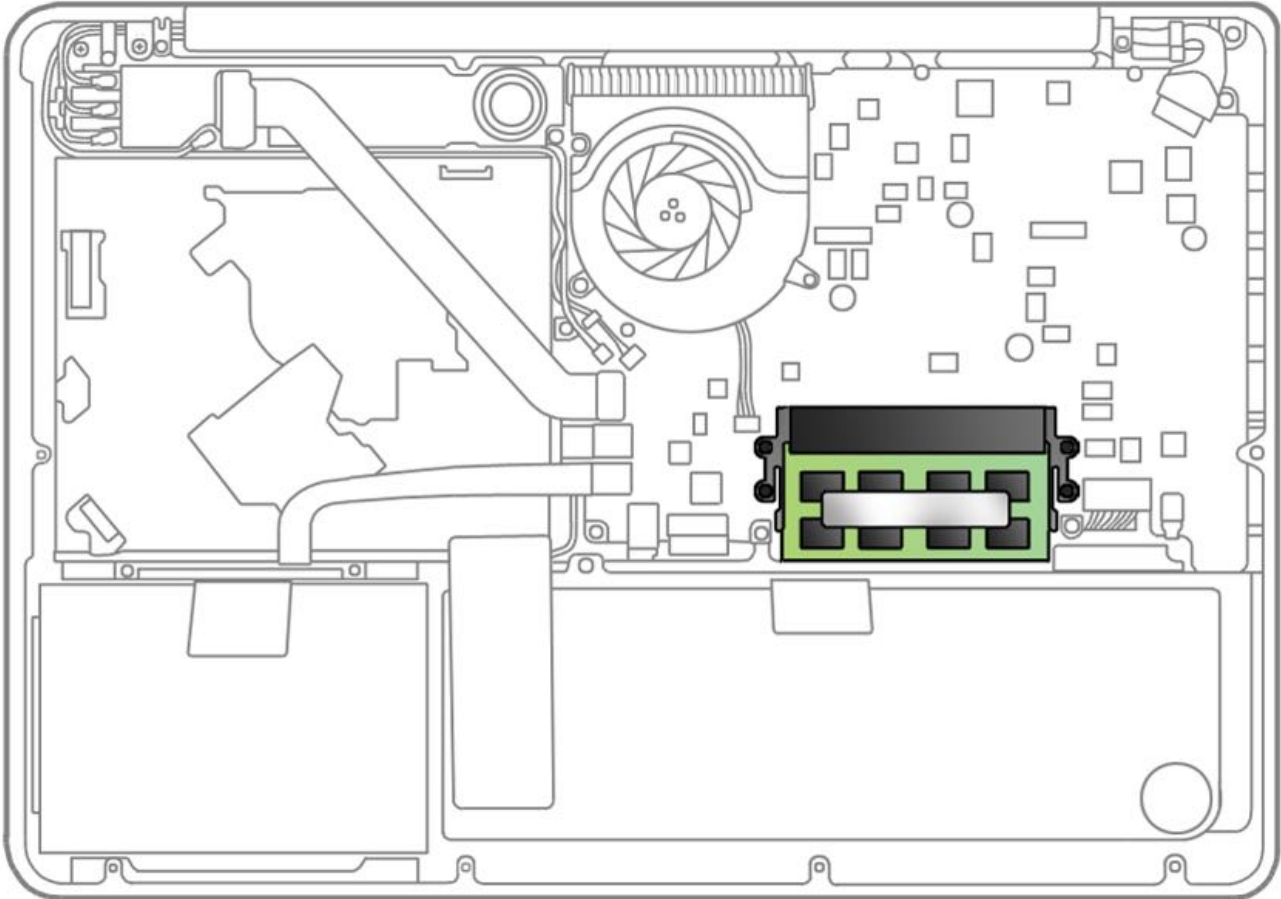


# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Memory

## First Steps

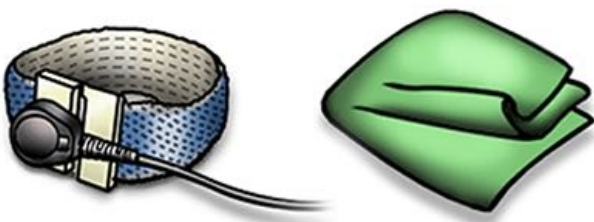
Remove:

- [Bottom Case](#)



## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth

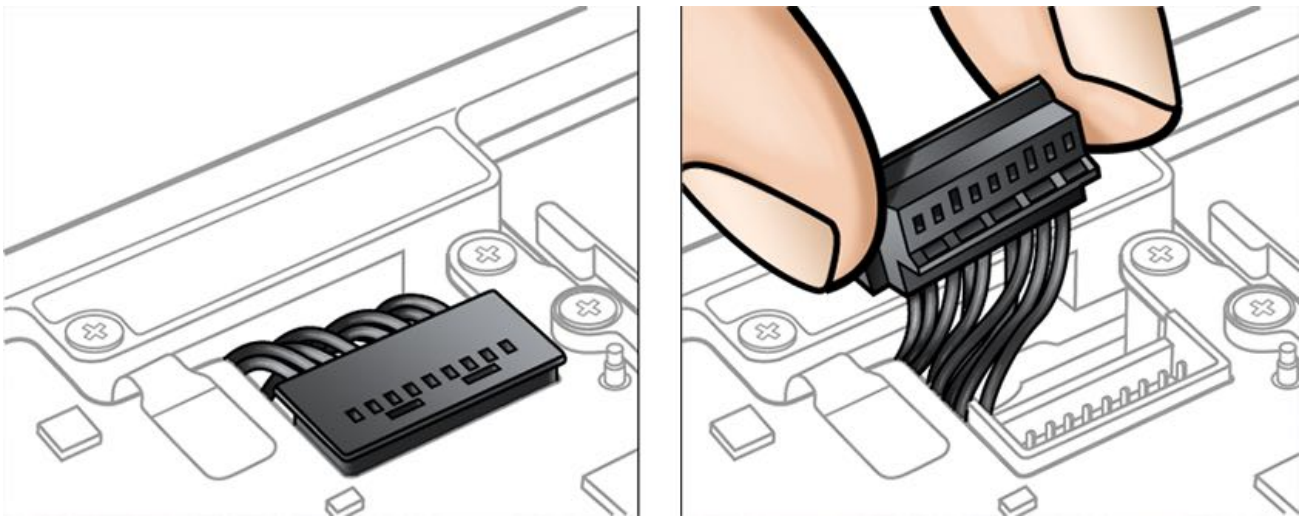


## Steps For Removal



Before you begin this procedure, disconnect battery from logic board. Failure to do so could damage computer.

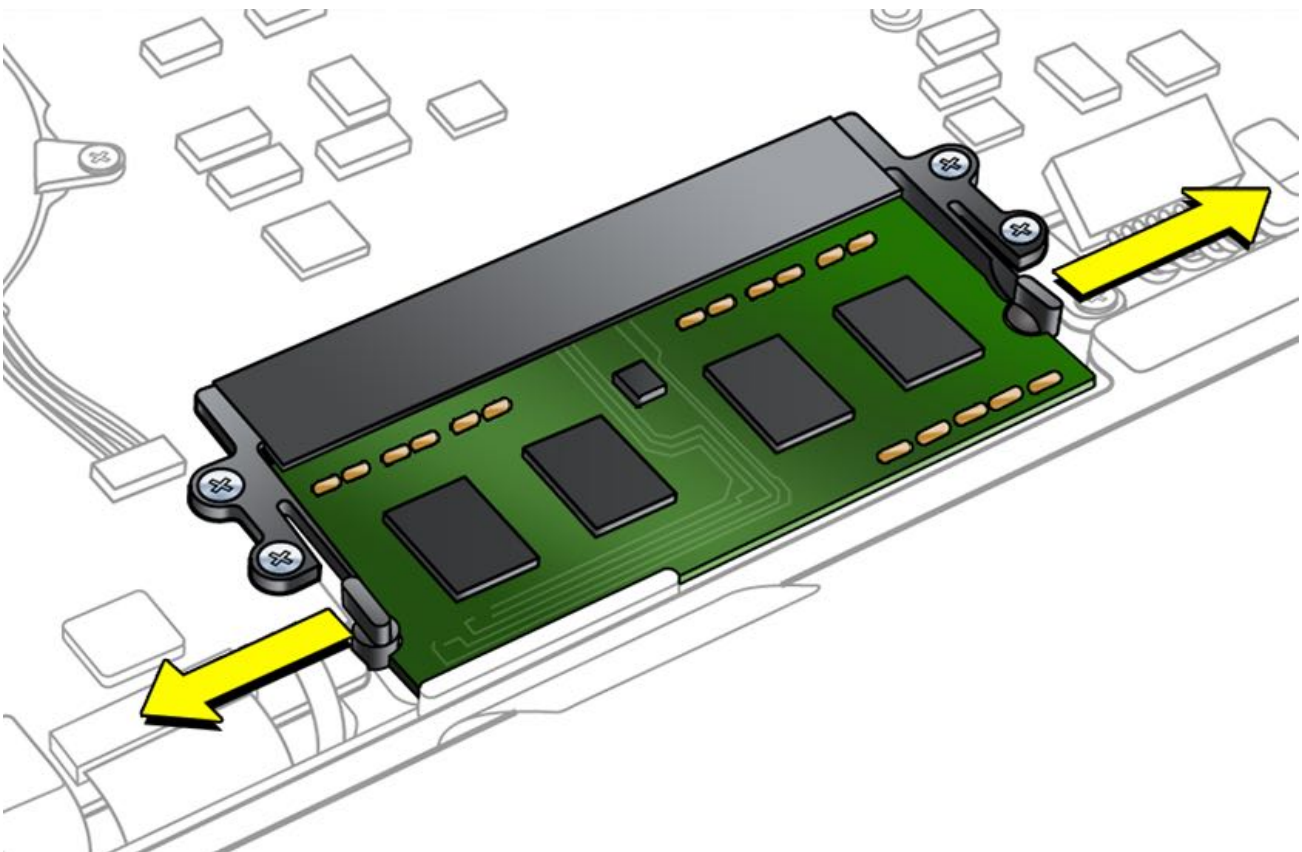




MacBook Pro (13-inch, Early and Late 2011, Mid 2012) come with a minimum of 4 GB (two 2 GB modules) of Double Data Rate 3 (DDR3) Synchronous Dynamic Random-Access Memory (SDRAM) installed. There are two slots that can accept SDRAM Small Outline Dual Inline Memory Modules (SO-DIMMs). The slots are stacked on the logic board under the bottom case. For best performance, memory should be installed as pairs with an identical memory module in each slot. Maximum memory is 8 GB, with a 4 GB module installed in each slot.

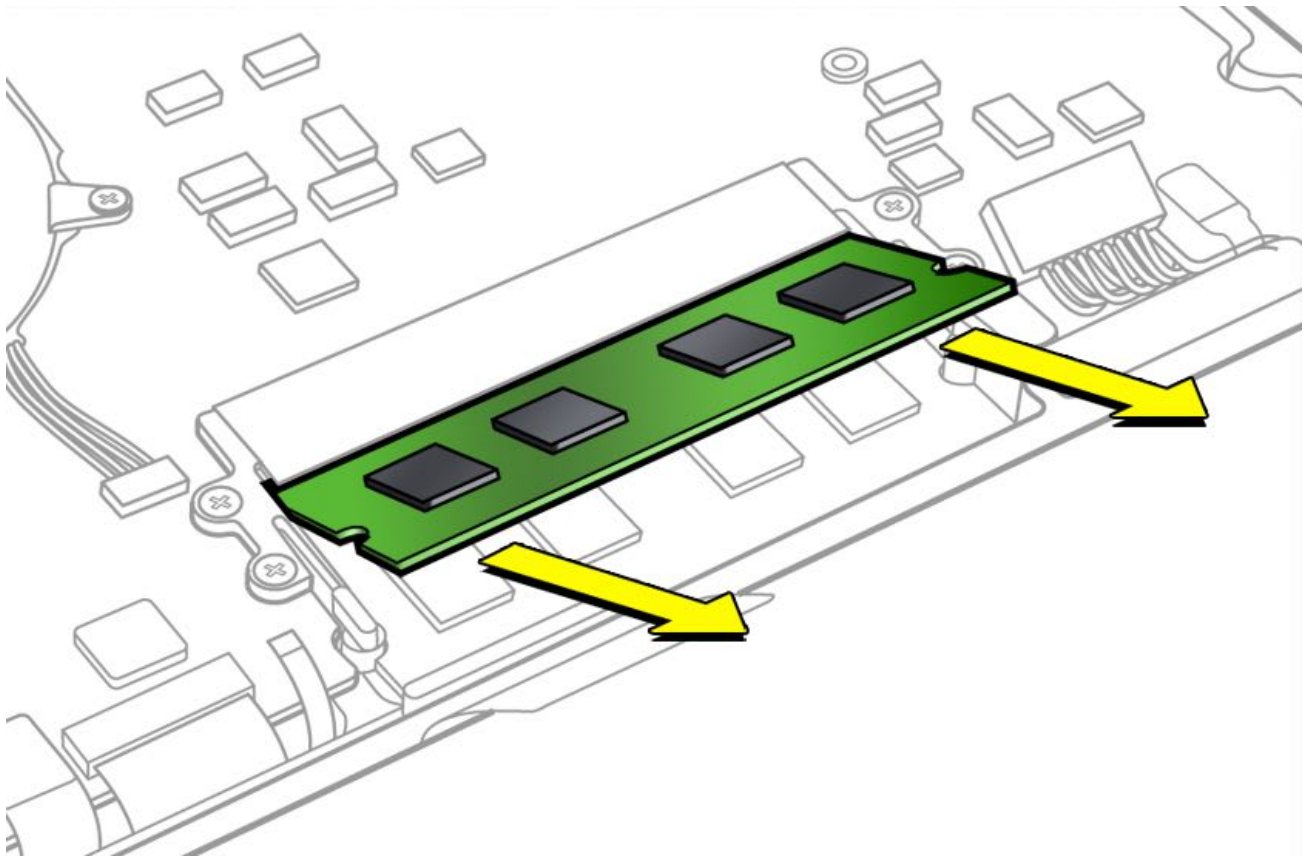
- 30 mm (1.18 inches)
- 2 GB, or 4 GB
- 204-pin
- MacBook Pro (13-inch, Early and Late 2011): PC3-10600 DDR3, SO-DIMM 1333 MHz RAM
- MacBook Pro (13-inch, Mid 2012): PC3-12800 DDR3, SO-DIMM 1600 MHz RAM

1. Press out 2 ejection levers until memory card tilts up completely.



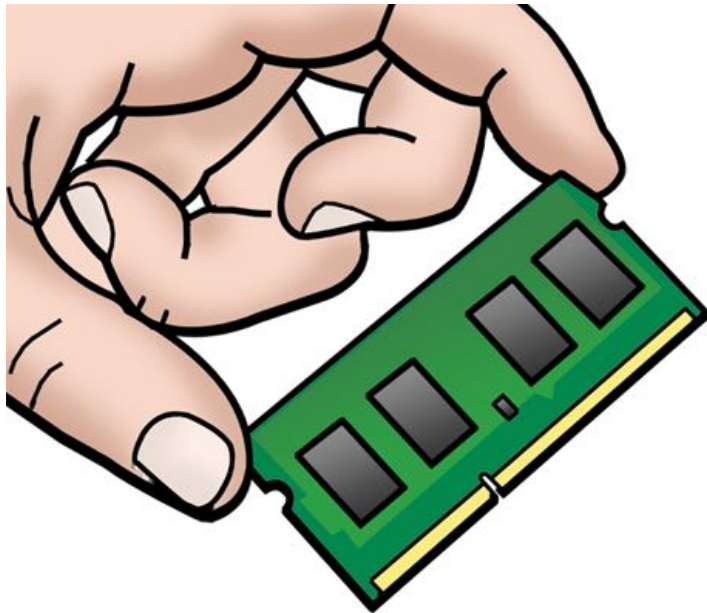
2. With memory card tilted up, make sure you can see the half-circle notches on either end of card. If not, press ejection levers again.

3. Pull out memory card.



**Important:** Hold card by edges only. Do not touch gold connectors.

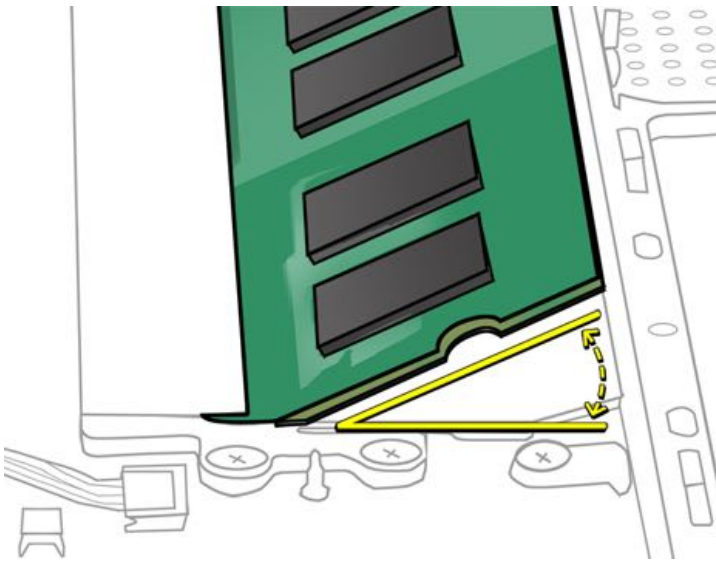
**Note:** Memory cards might have harmless white residue on gold connectors.



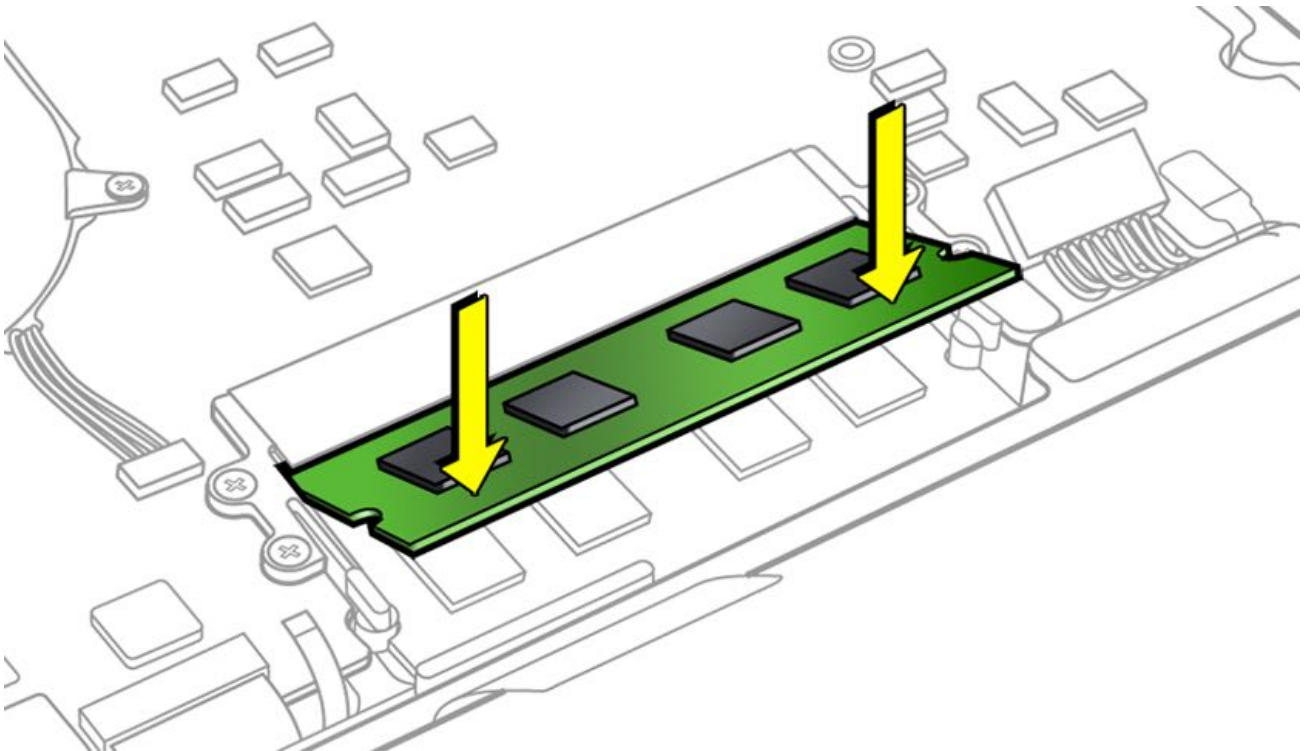
### Steps For Reassembly

1. Install memory cards at an angle, one at a time. If installing just one card, install it in lower slot.

**Note:** Memory cards might have harmless white residue on gold connectors.



2. Press memory card down until levers click into place in the half-circle notches on either end of card.
3. If you installed additional memory, verify that computer recognizes it.

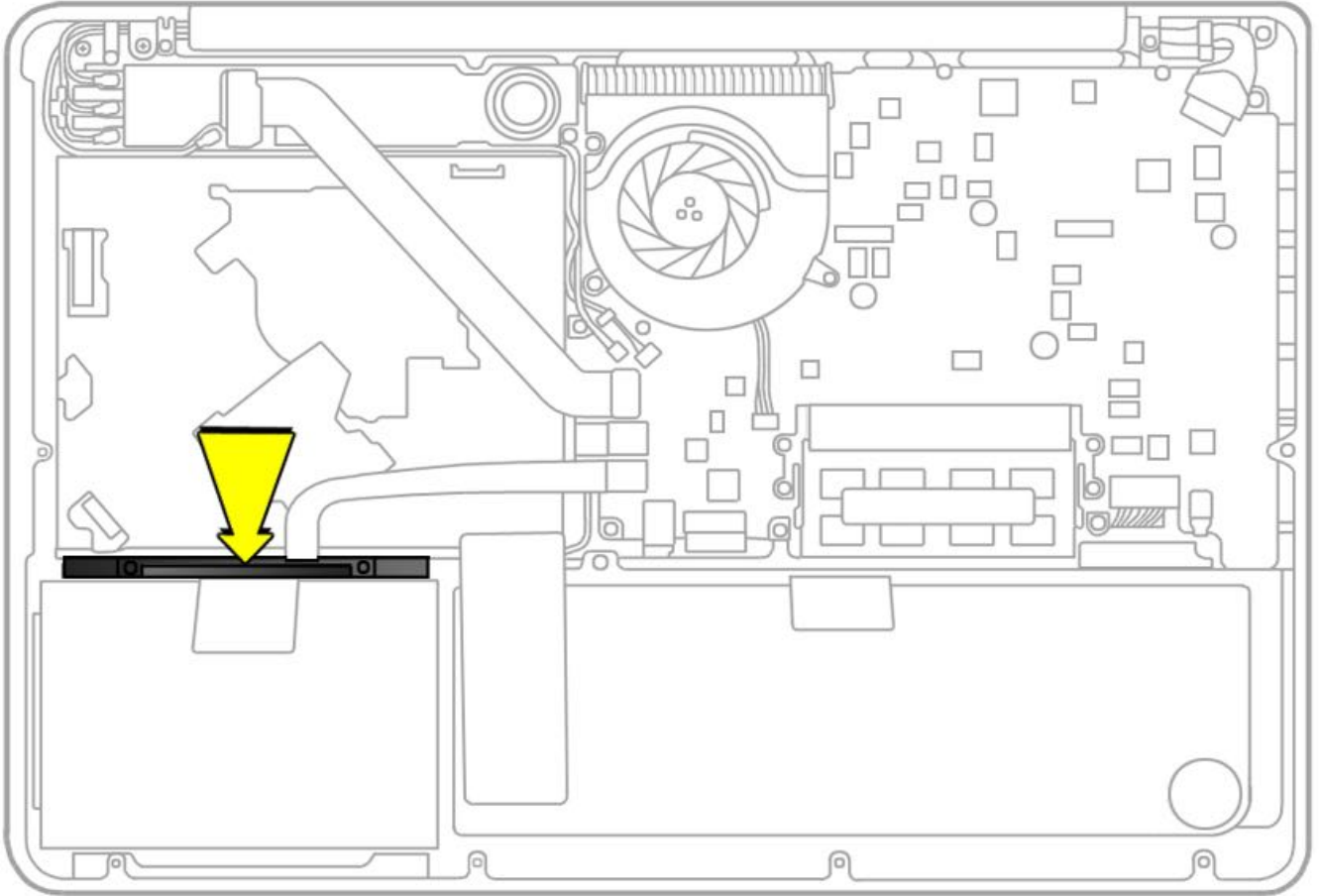


# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Rear Hard Drive Bracket

## First Steps

Remove:

- [Bottom Case](#)



## Tools

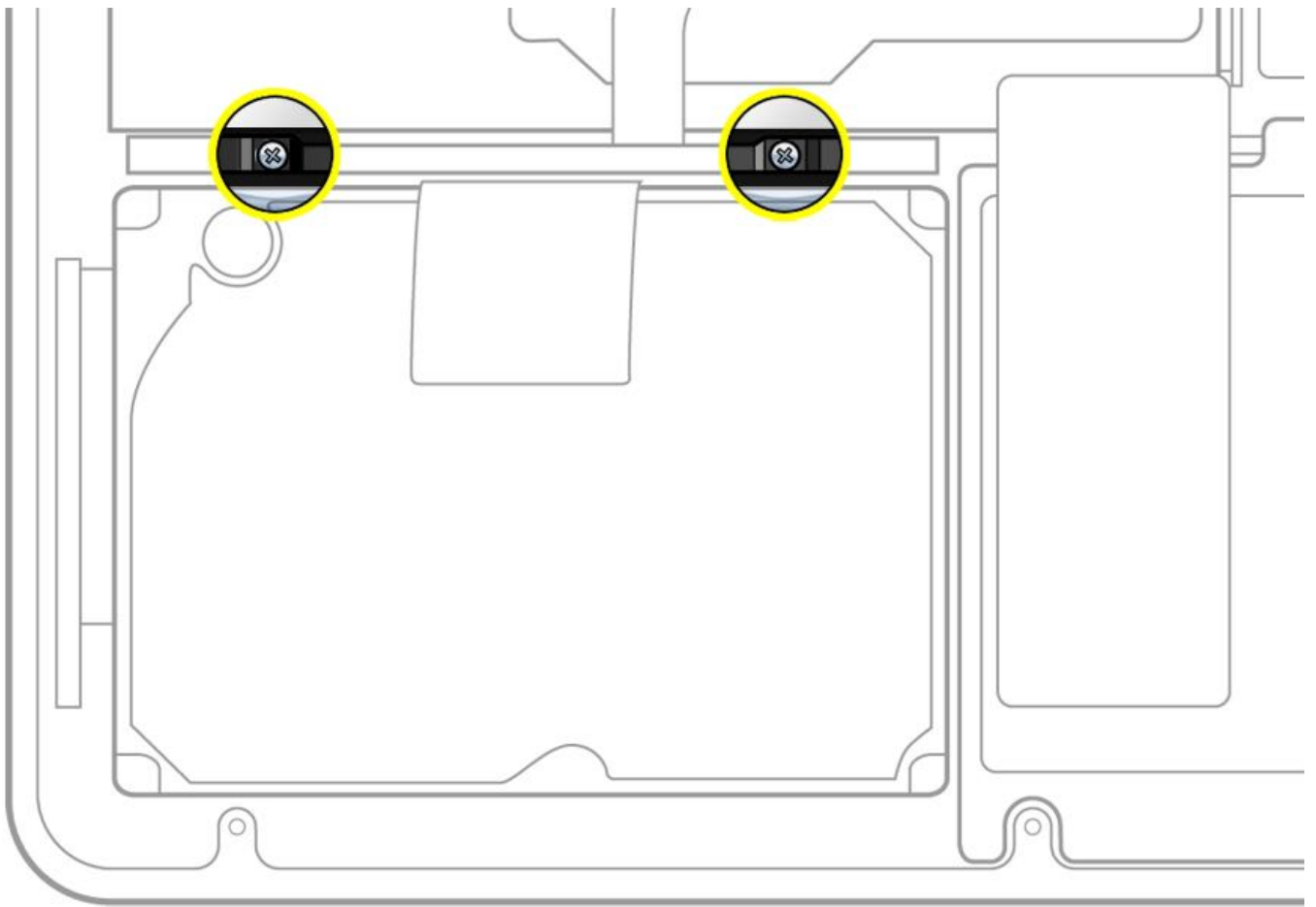
- ESD wrist strap
- Clean, soft, lint-free cloth
- Phillips #00 screwdriver, magnetized



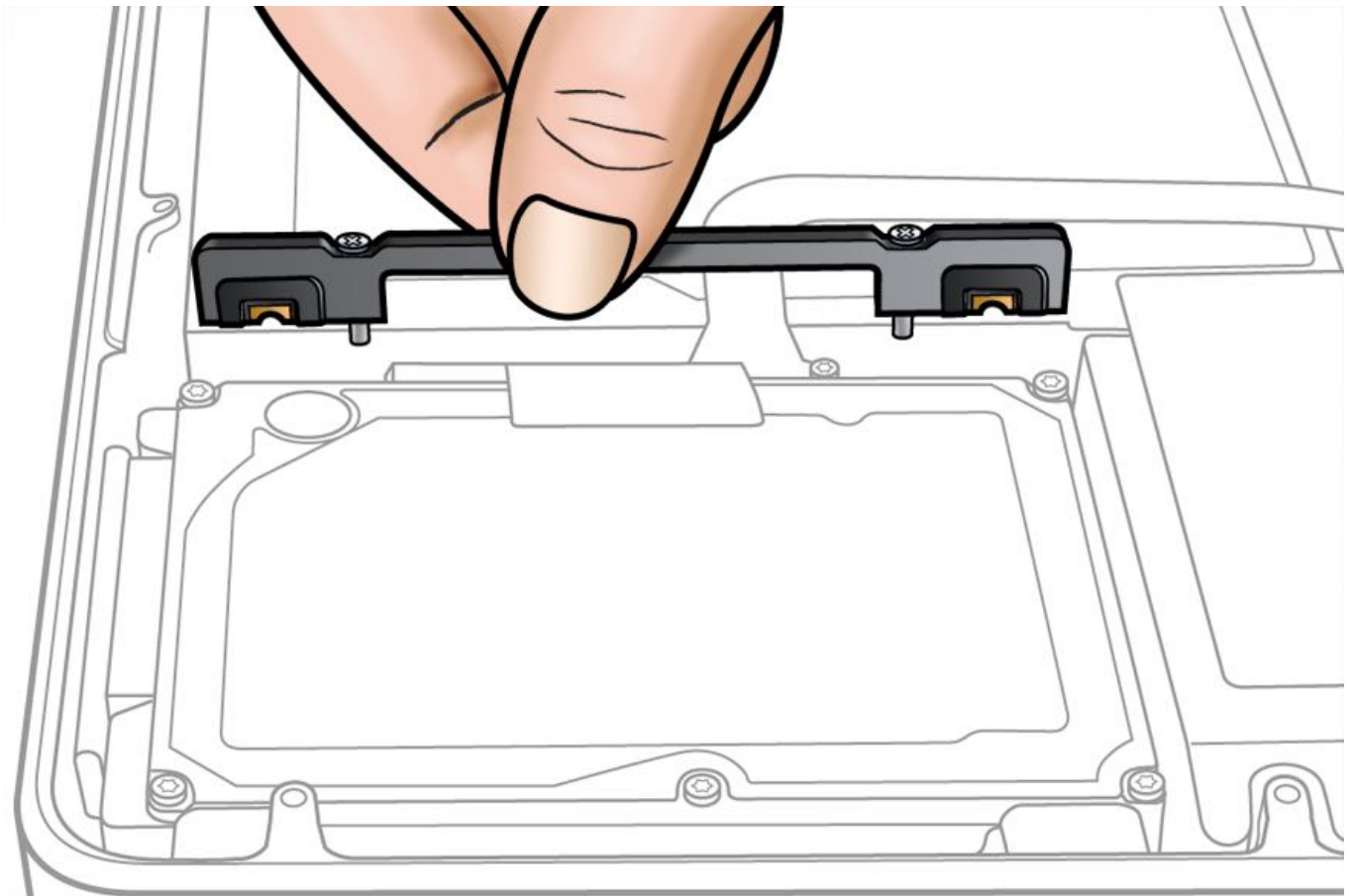
## Steps For Removal

1. Loosen 2 Phillips #00 captive screws.



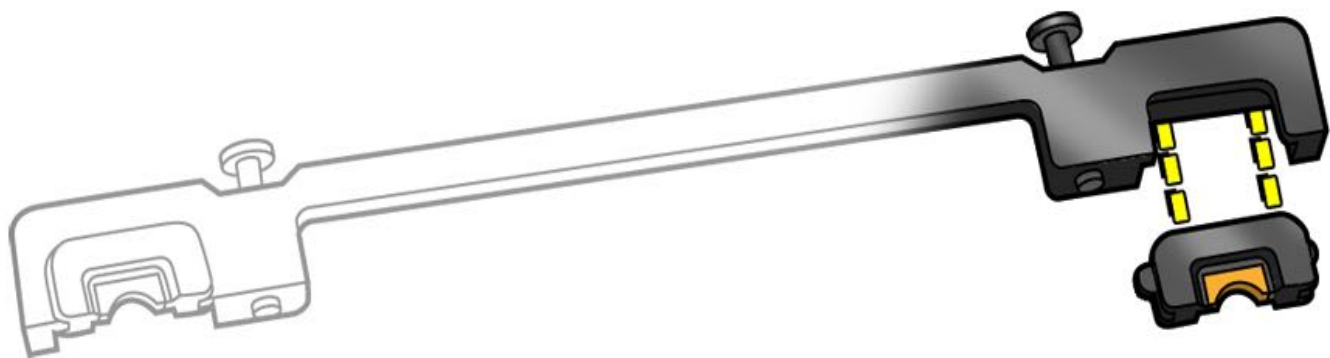


2. Lift out bracket.



### Steps For Reassembly

**Note:** Make sure 2 orange and black rubber grommets are included in bracket before installing it.

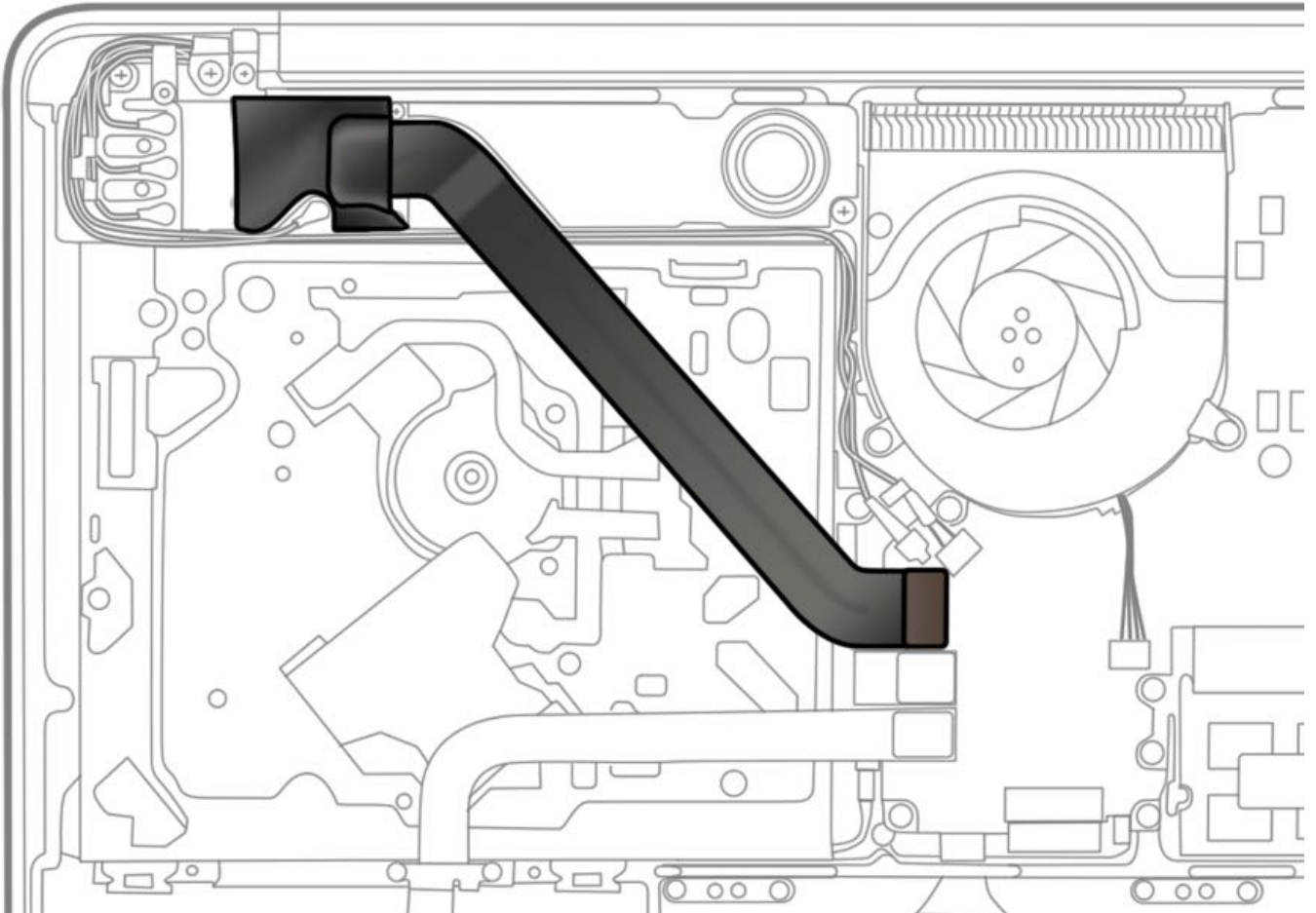


# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): AirPort/Bluetooth Flex Cable

## First Steps

Remove:

- [Bottom Case](#)
- [Battery](#)



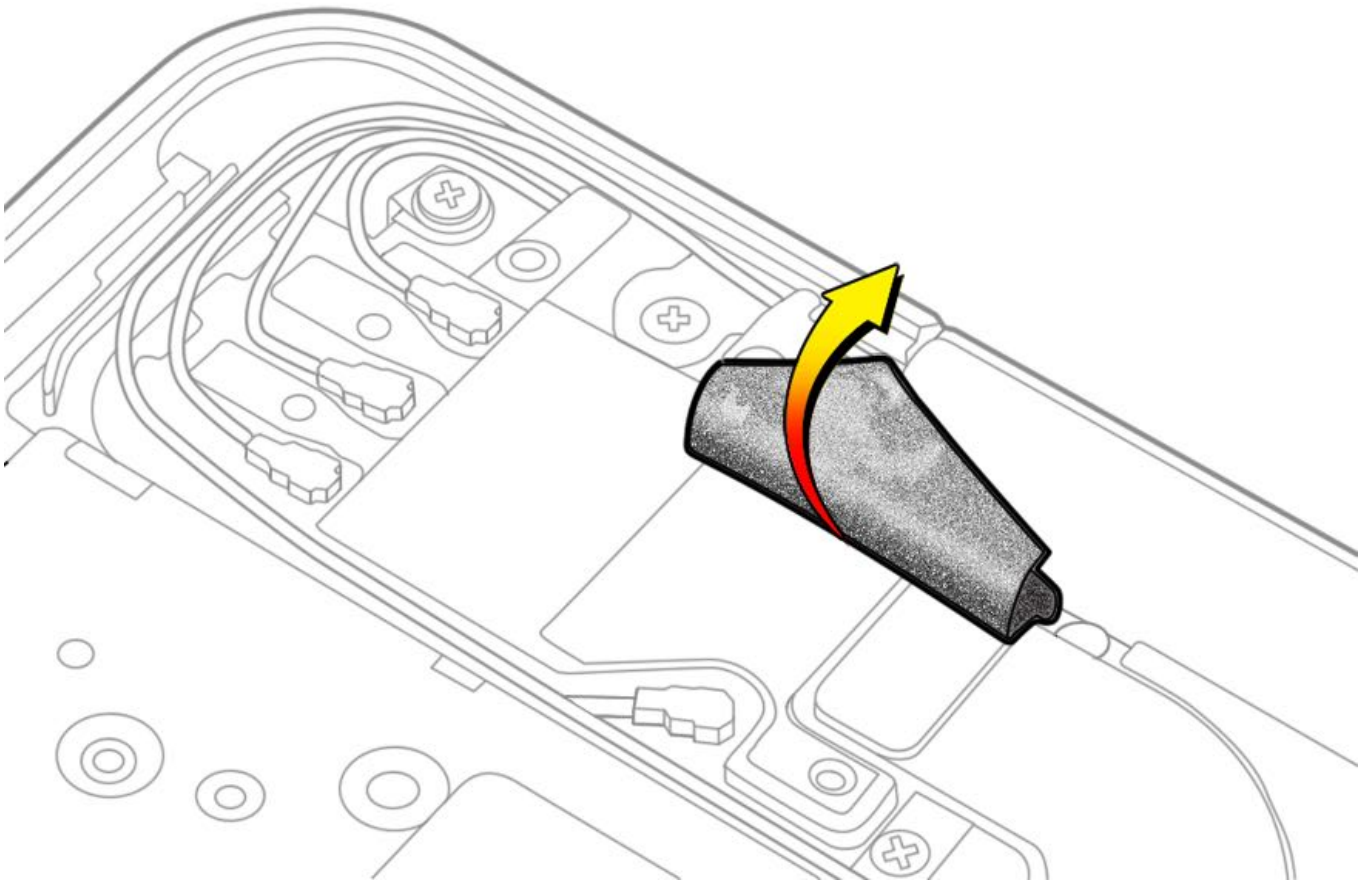
## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Black stick



## Steps For Removal

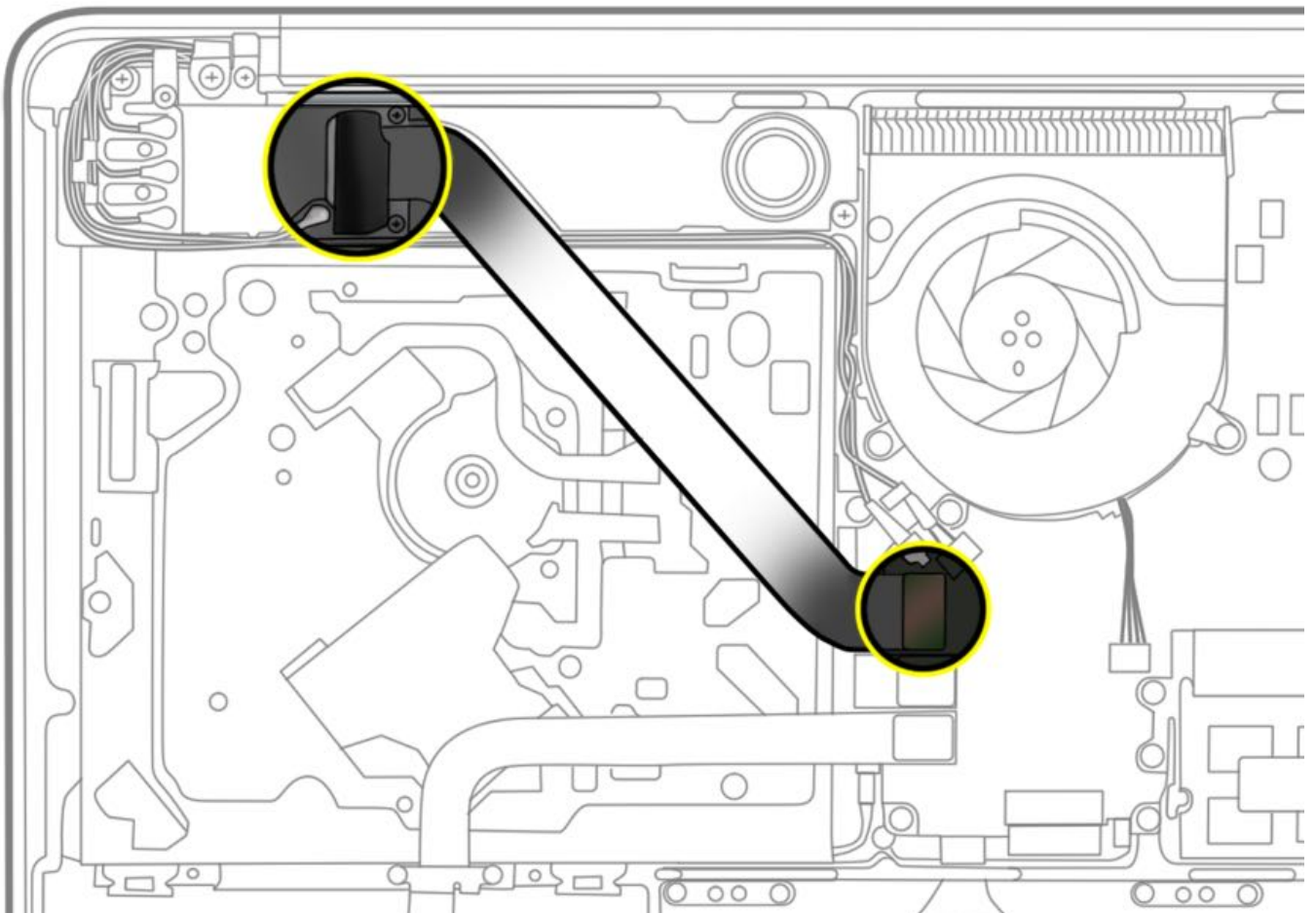
1. Use black stick to carefully peel back the conductive wrap covering the flex cable.



2. With black stick, disconnect both ends of flex cable.

3. Remove cable from bottom case.

**Note:** The conductive wrap may lose its adhesiveness after repeated unpeeling and re-sticking. Use kapton tape to hold conductive wrap in place if adhesiveness is lost.



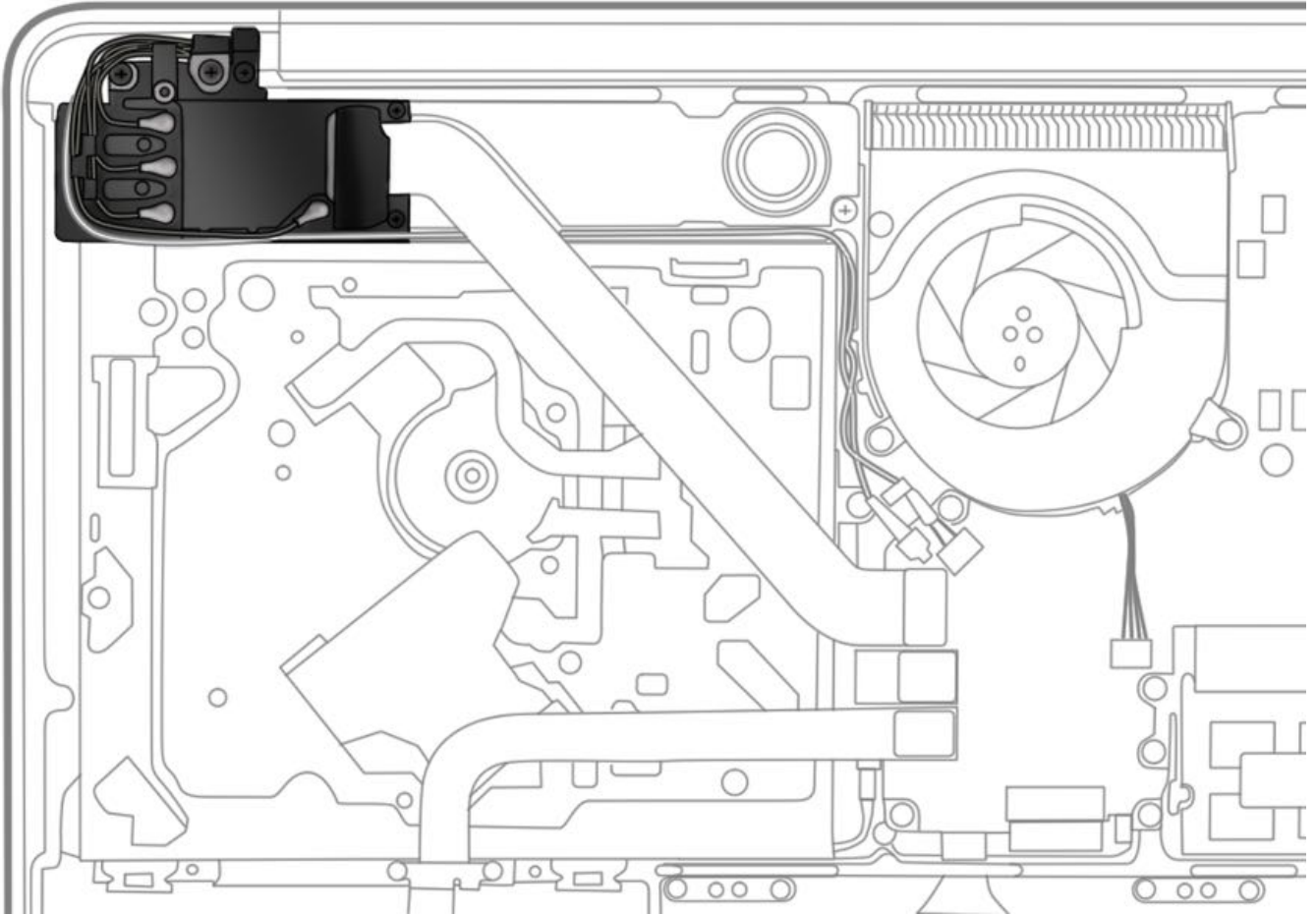
## Steps For Reassembly

# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): AirPort/Bluetooth Card With Holder

## First Steps

Remove:

- [Bottom Case](#)
- [Battery](#)
- [AirPort/Bluetooth Flex Cable](#)
- Camera Cable from [Logic Board](#)



## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Black stick(s) (1 or 2)
- Magnetized Phillips #00 screwdriver

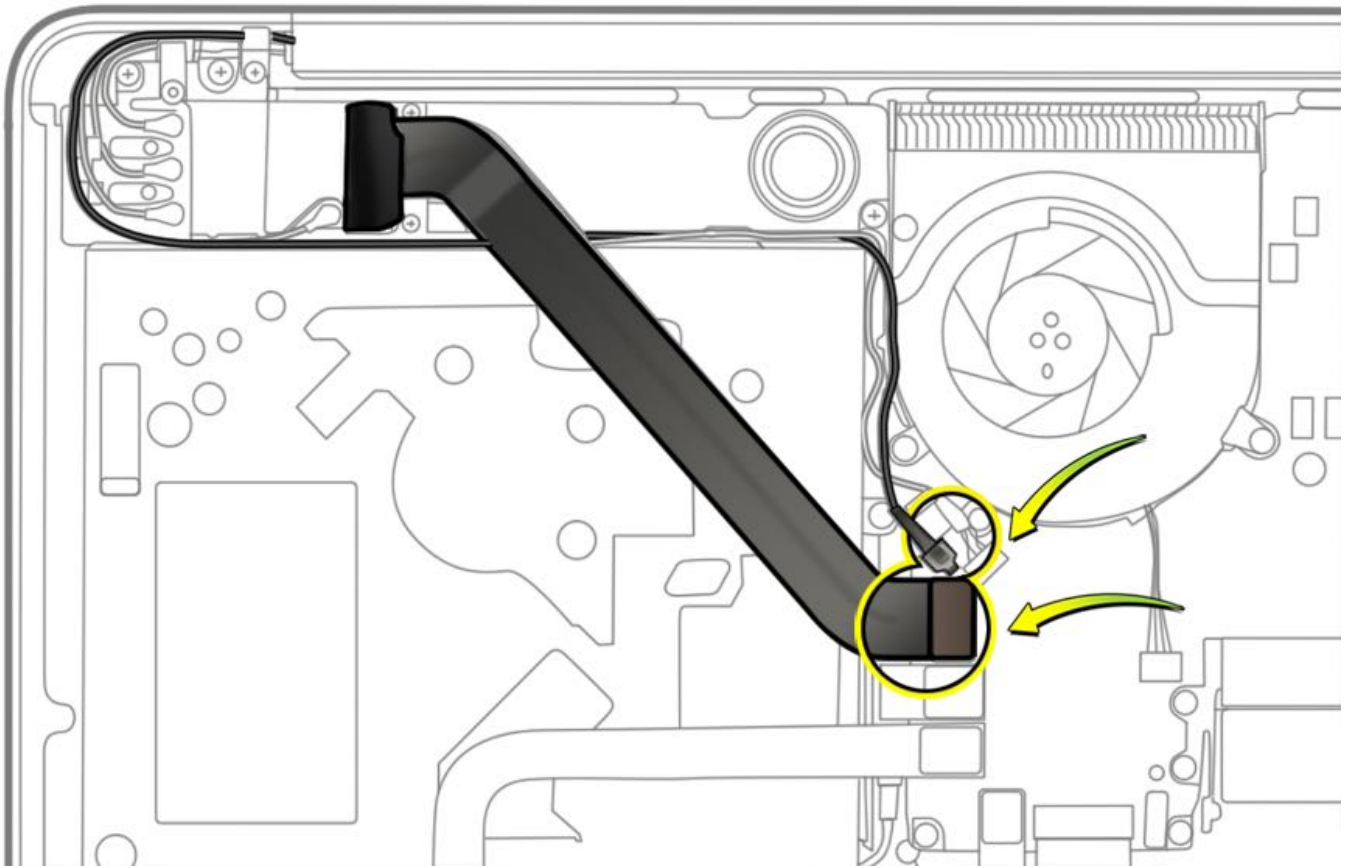


## Steps For Removal

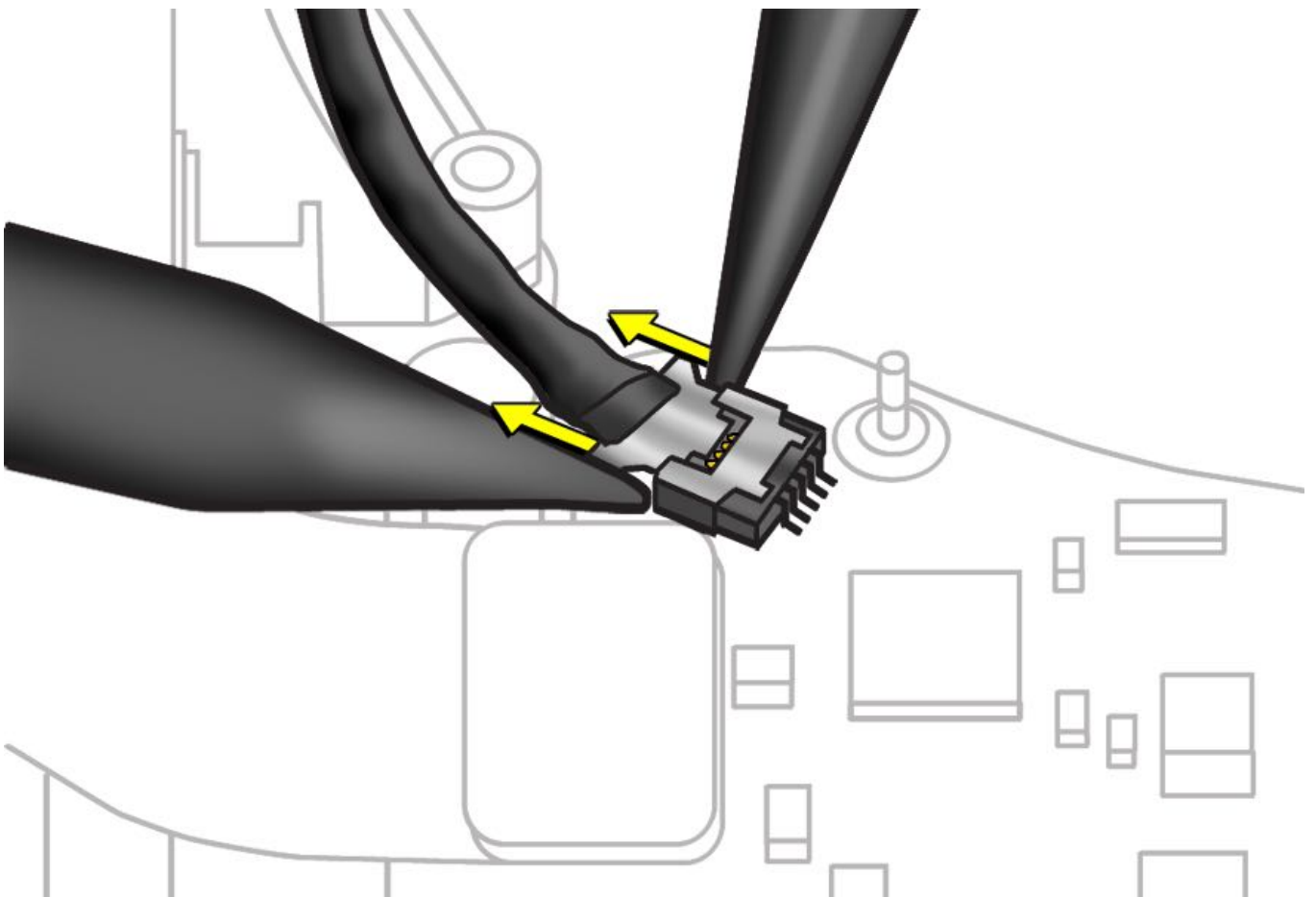
1. Disconnect camera cable and AirPort/Bluetooth cables from logic board.

**Note:** Lift gently to disconnect camera cable from its routing. Cable is held in place with adhesive. When rerouting cable, secure it using same adhesive.





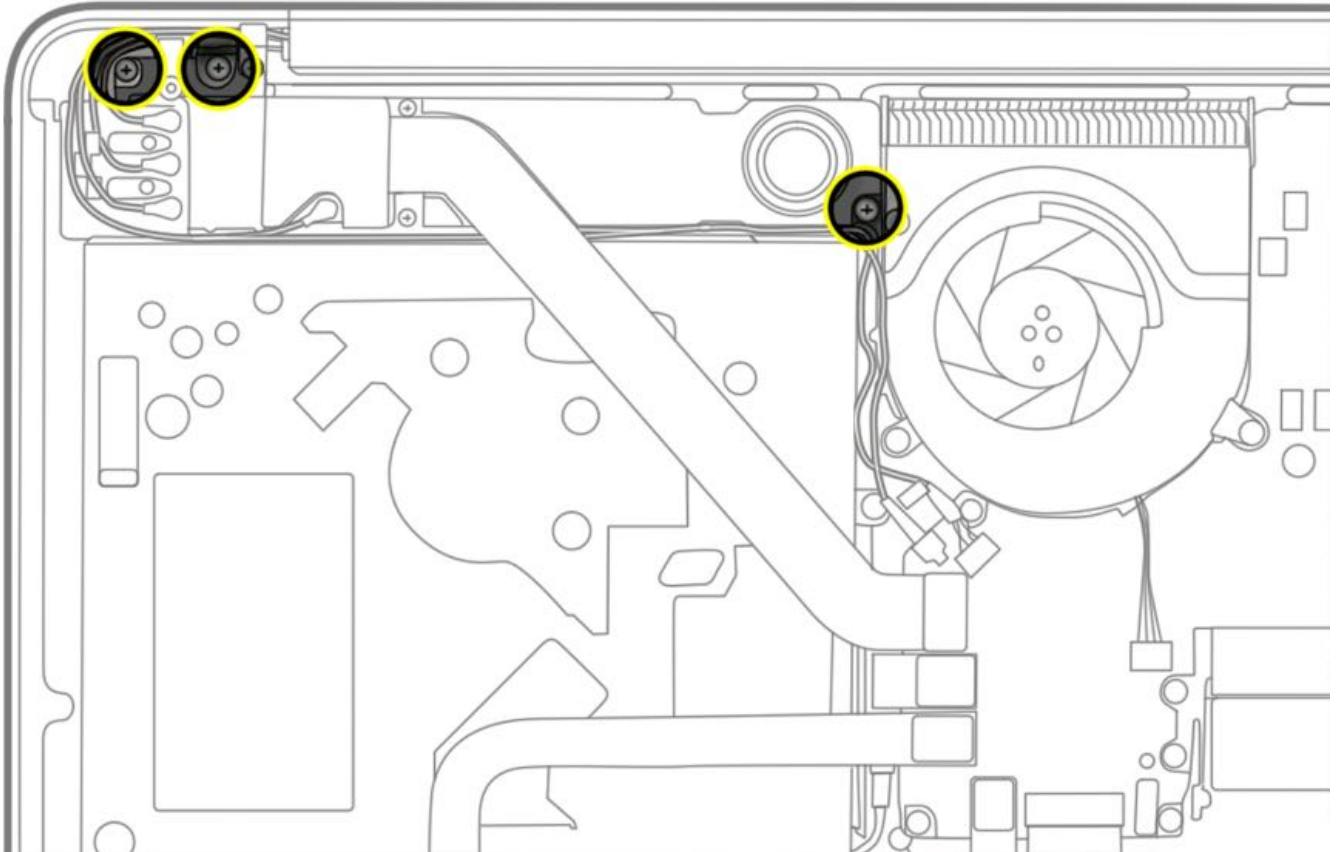
**Note:** When disconnecting camera cable, use two black sticks (or one black stick, alternating sides) to disconnect cable evenly.



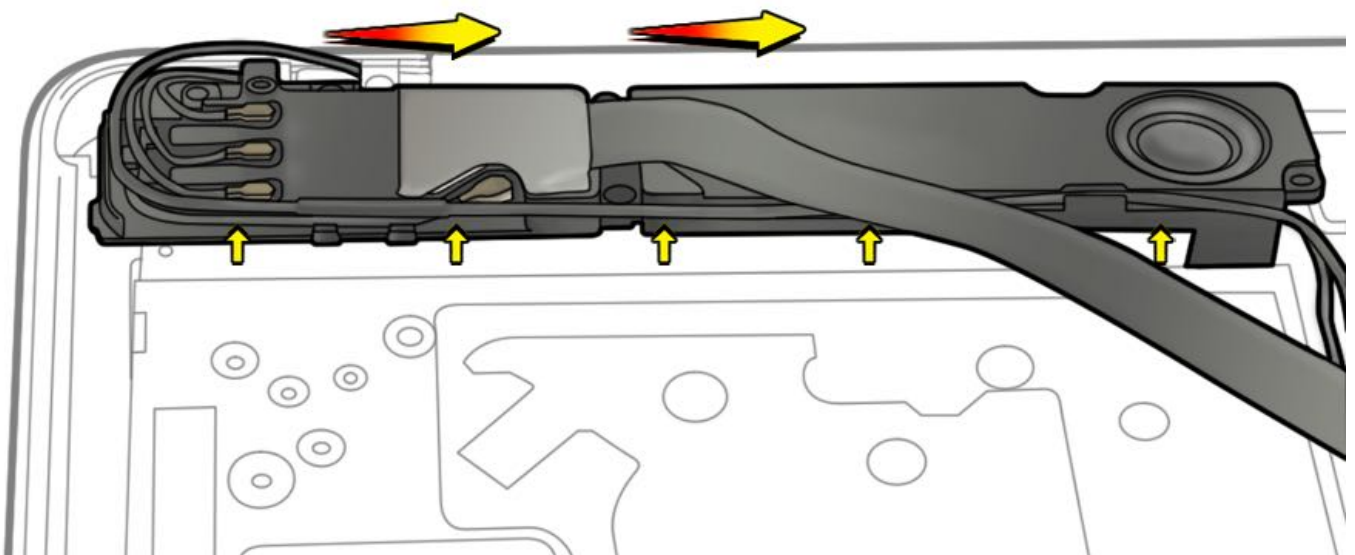
2. Remove 3 screws:

- 2 (8.1 mm) 922-9107

- 1 (4.5 mm) 922-8744



3. Move the card up and to the right.

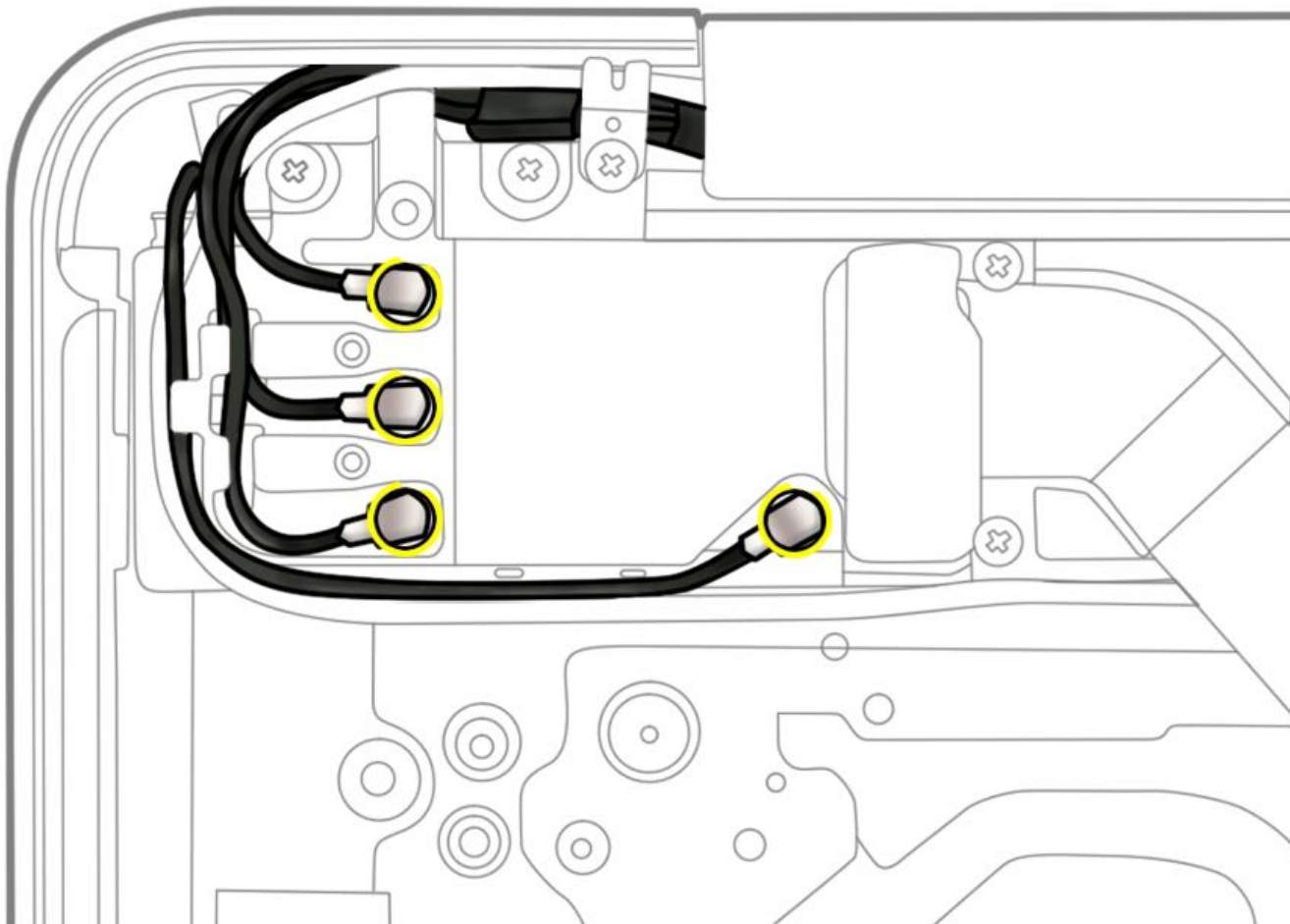


4. Disconnect cables from card:

- 1 Bluetooth antenna cable
- 3 AirPort antenna cables

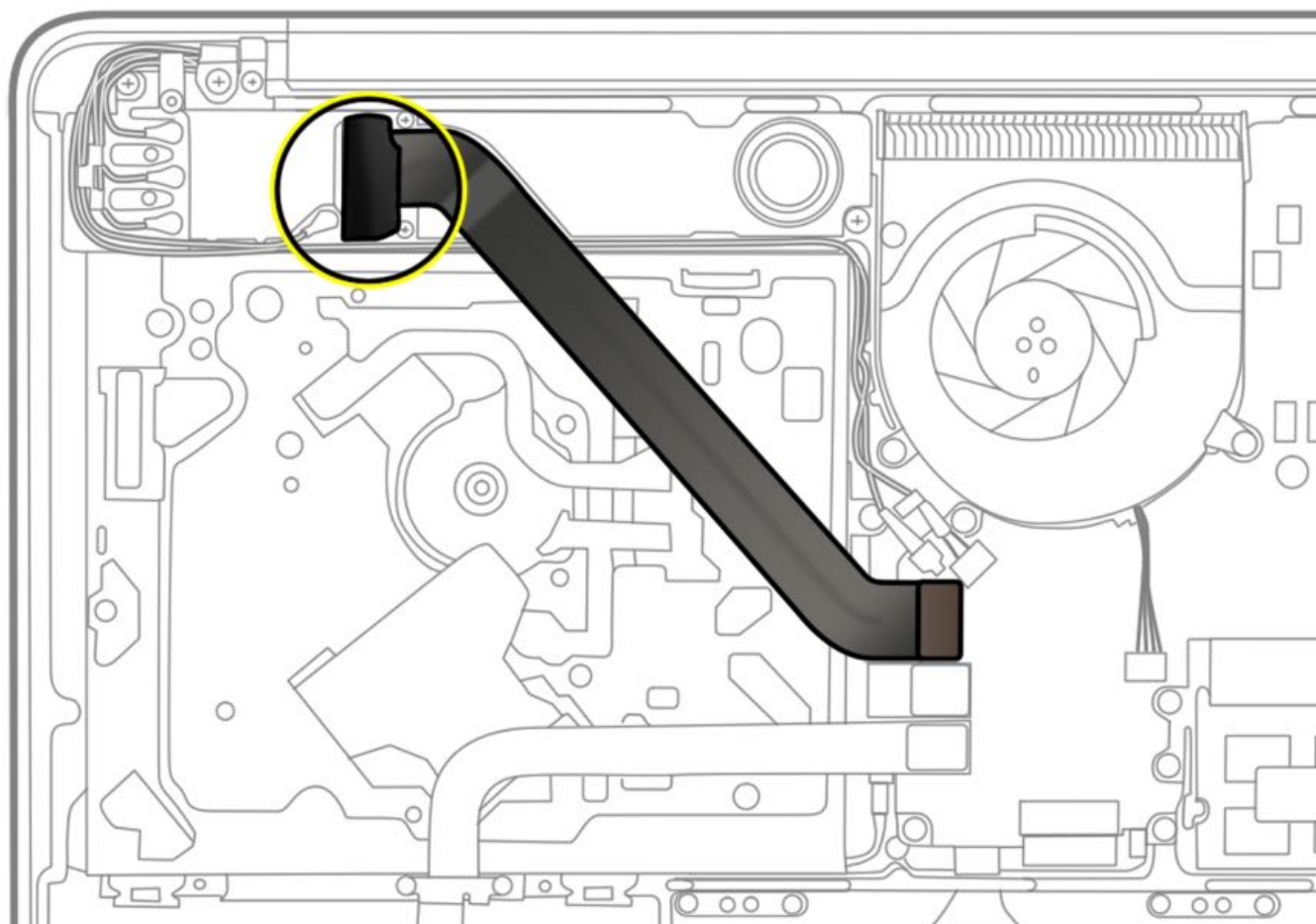
**Note:** Lift metal connector of each cable straight up.



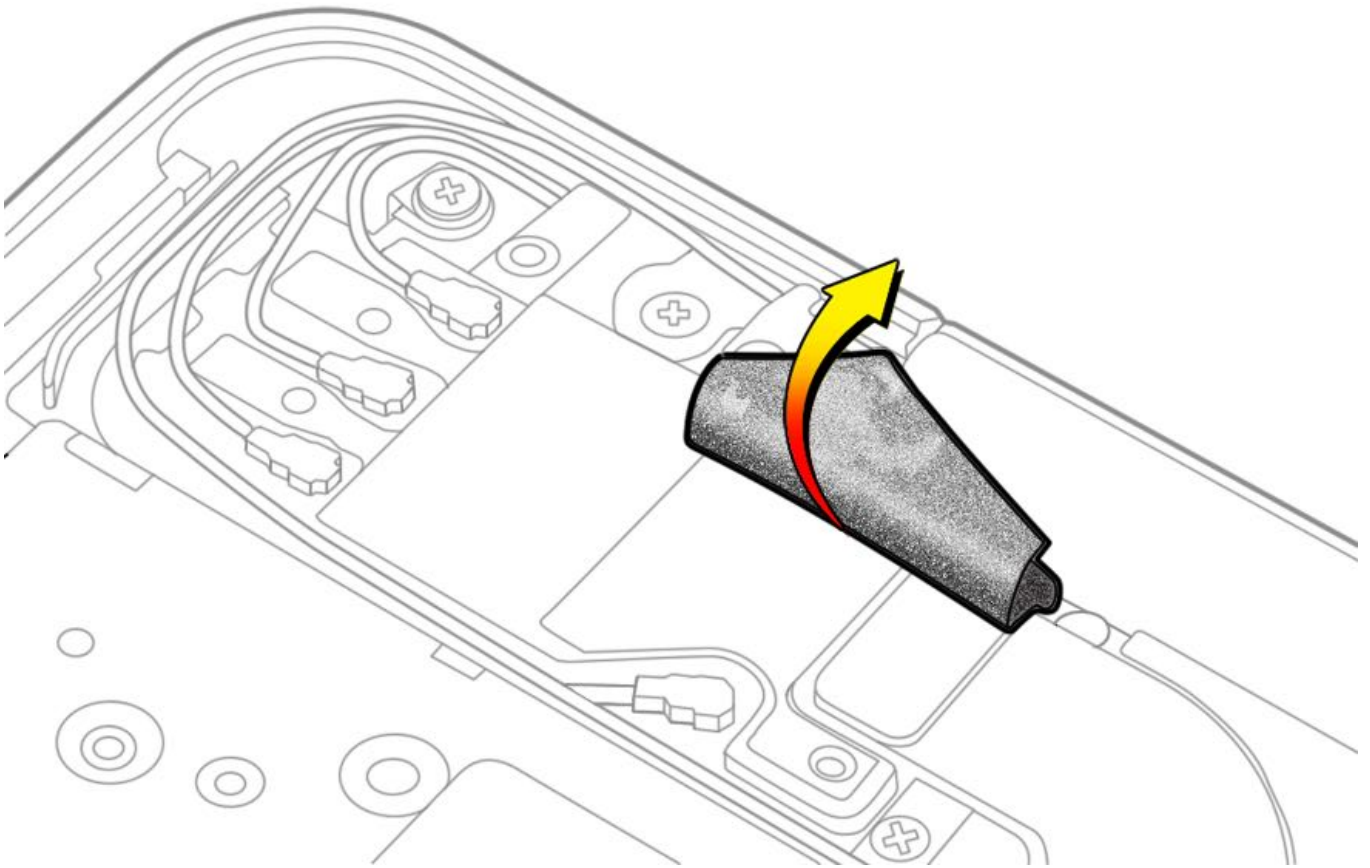


5. Disconnect AirPort/Bluetooth flex cable from card and set cable aside.

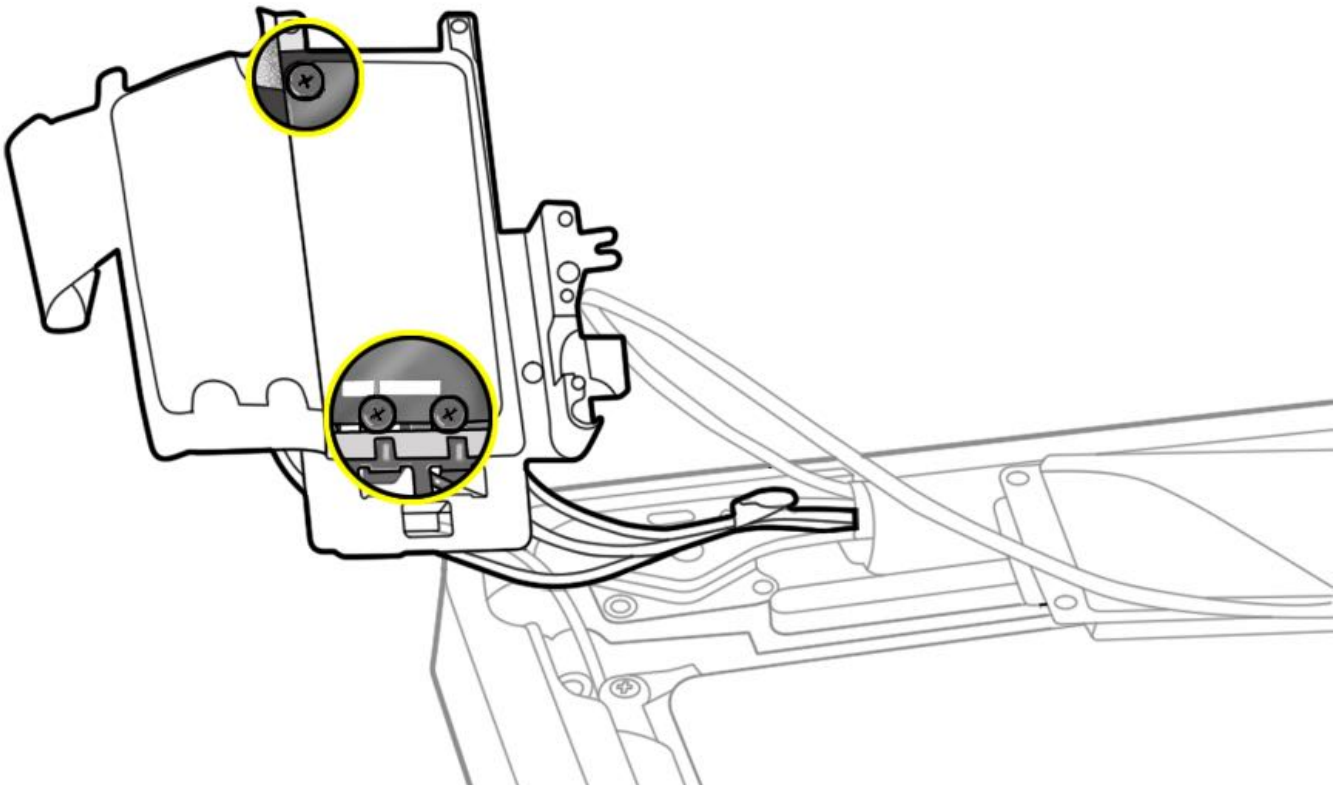
**Note:** You must first peel back tape covering flex cable's connector.



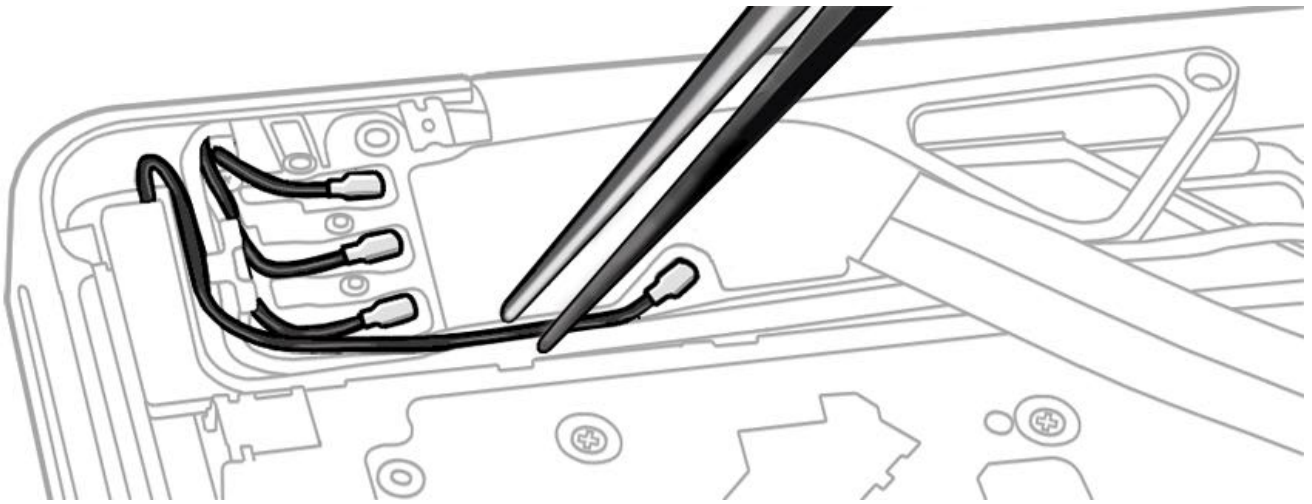
6. Peel back wrap covering card and underside of holder.



7. To remove card from holder, remove 3 (2.5 mm) 922-9761 screws and lift card from holder.

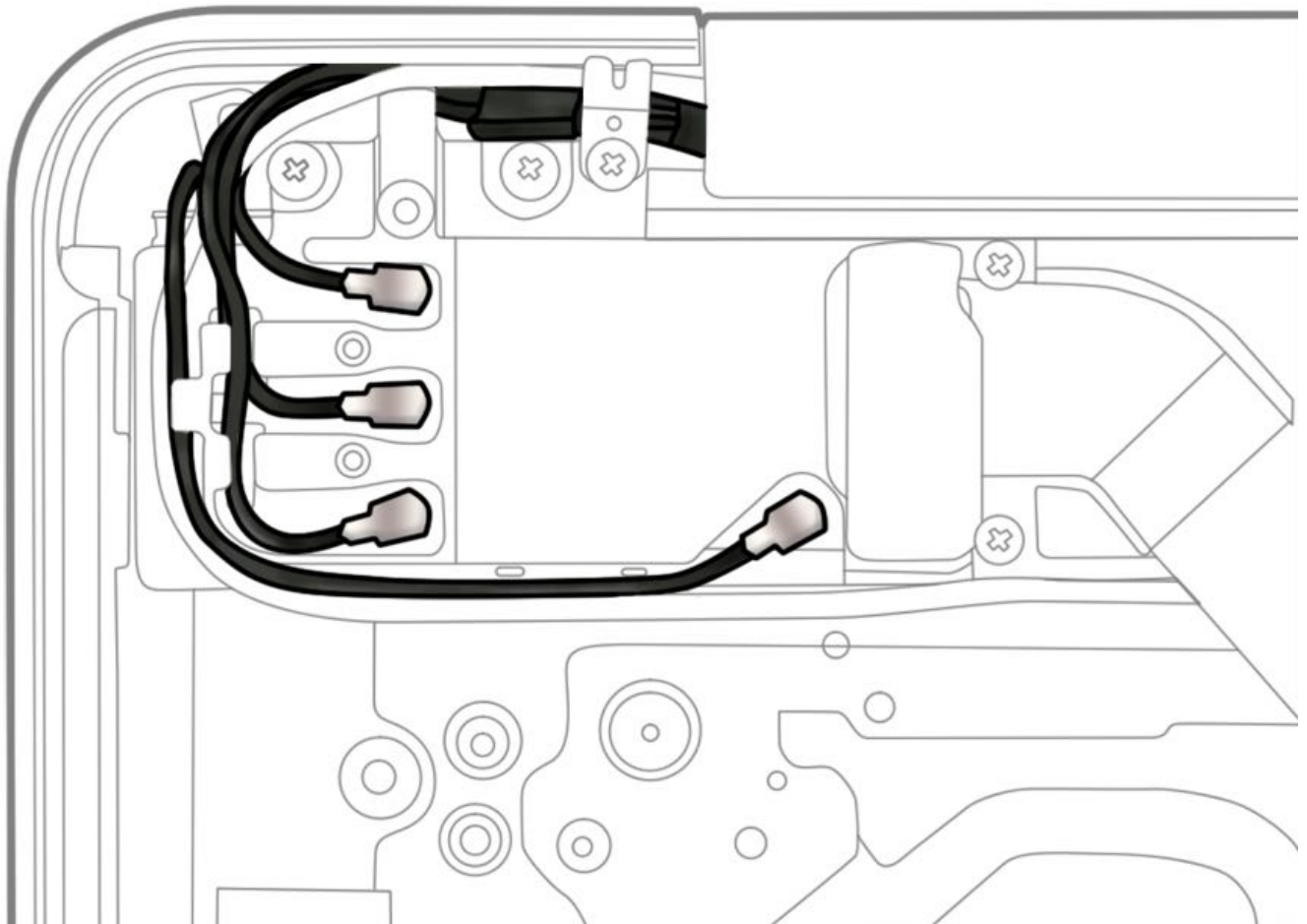


8. If you are removing card holder from top case, use a black stick or needlenose pliers to pry cables from the holder's channels, and remove card holder from case.



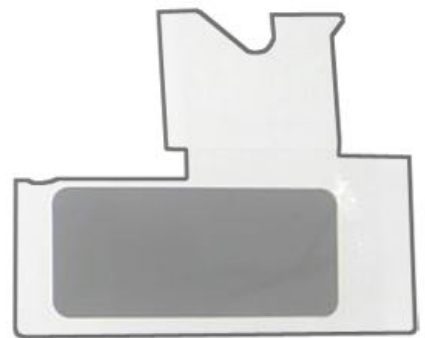
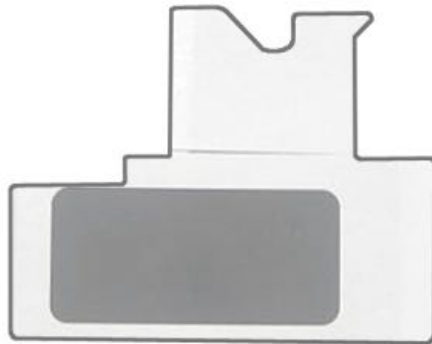
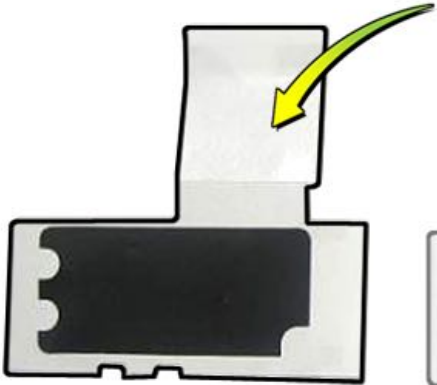
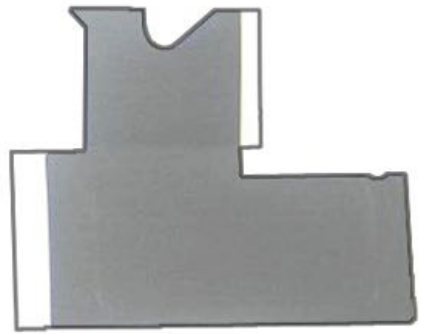
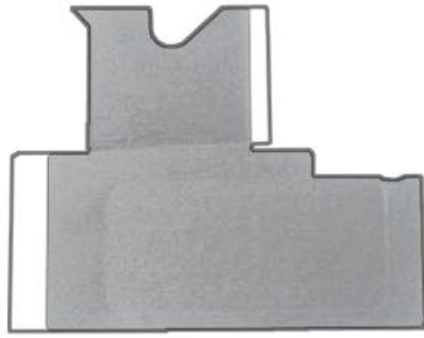
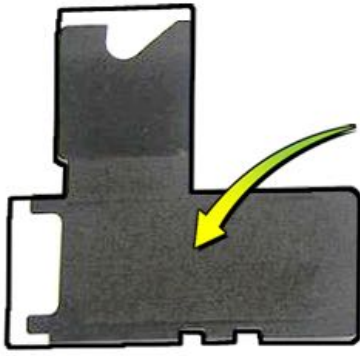
## Steps For Reassembly

**Replacement Note:** Reroute cables in cardholder as shown. Insert cables onto card before screwing card carrier to top of optical drive. Inserting cables while carrier is on top of optical drive can damage the optical drive.

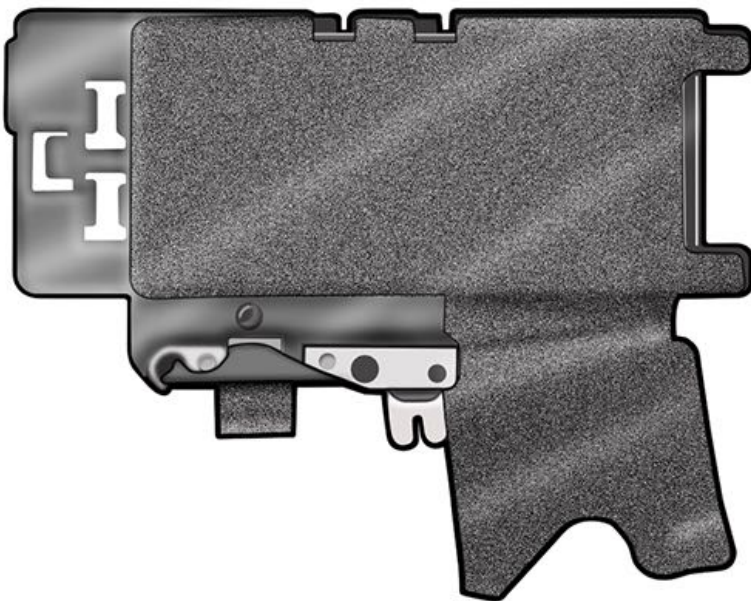


**Important:** Every time you install a replacement AirPort/Bluetooth card or card holder, you must also replace the card's thermal pad and conductive wrap.

- Cards and card holders are provided as kits, which include the thermal pad and 3 conductive wraps (designed for 3 different models).
- Use the illustration below to select the MacBook Pro (13-inch, Early and Late 2011) wrap, marked with yellow arrow.
- Discard remaining 2 wraps.

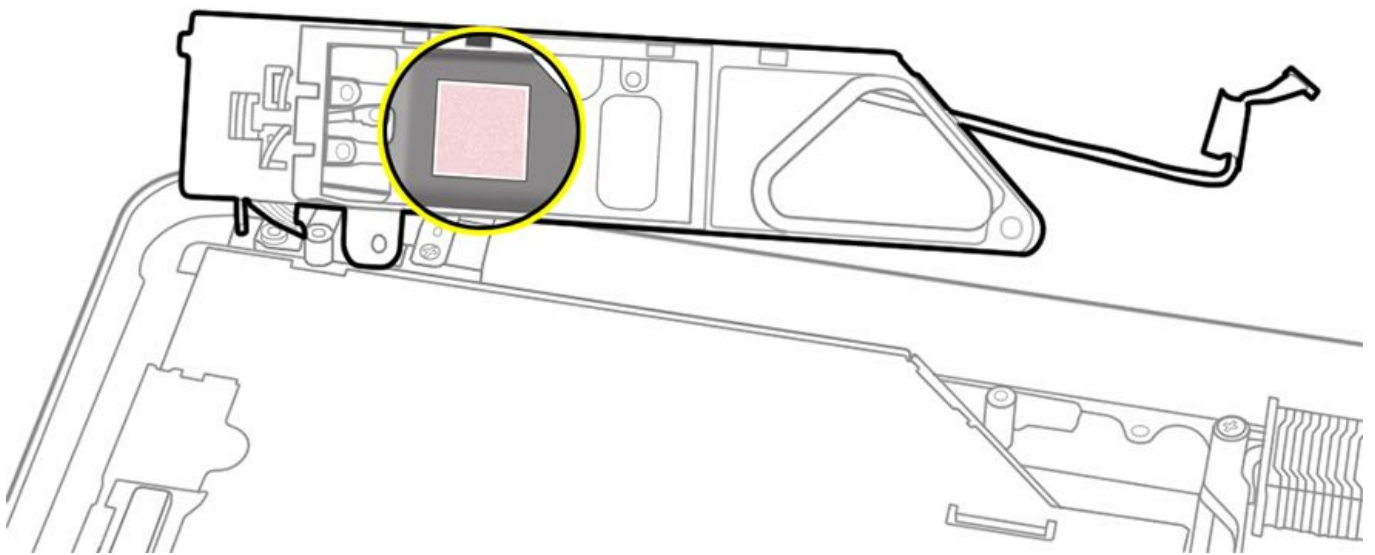


1. If you haven't already, remove original conductive wrap from card and card holder.

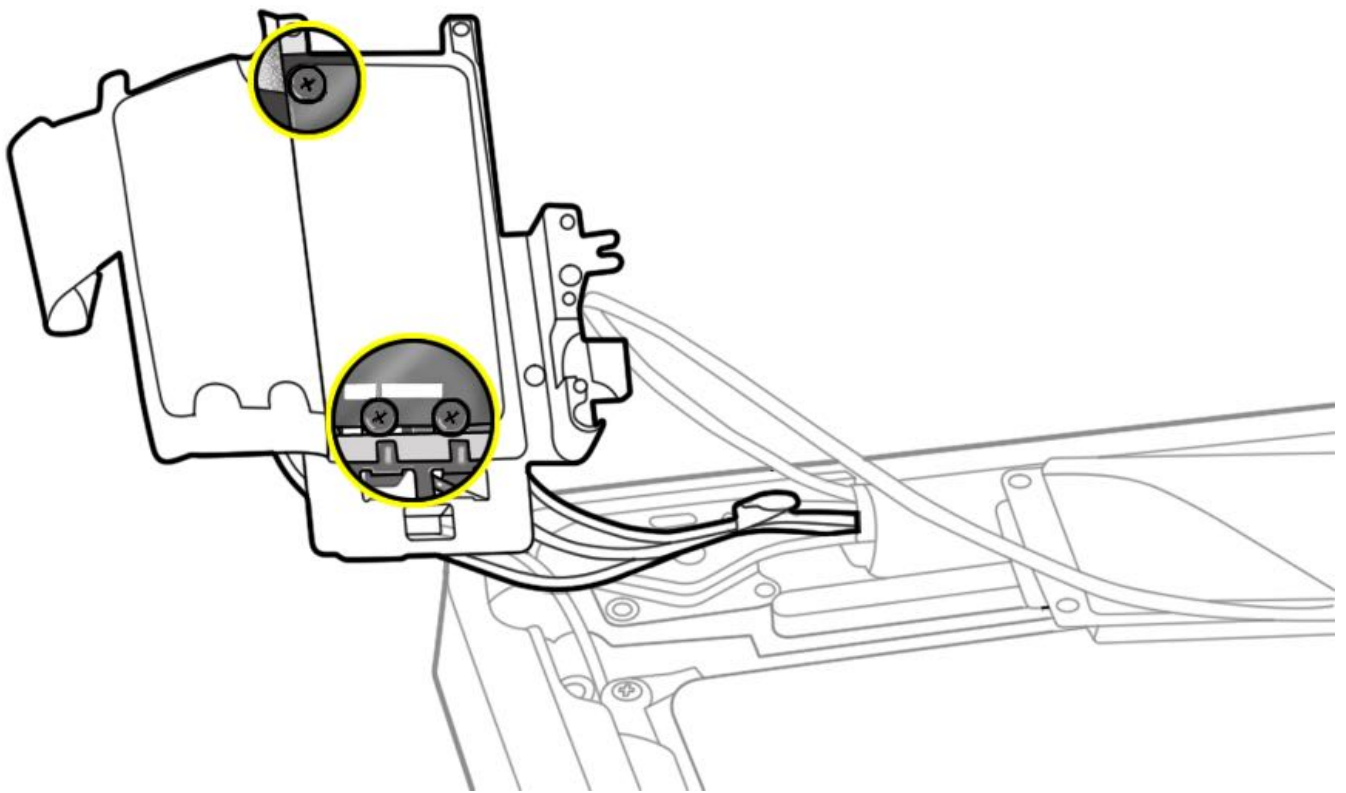


2. Peel off protective film from back of thermal pad and install pad in card holder as shown

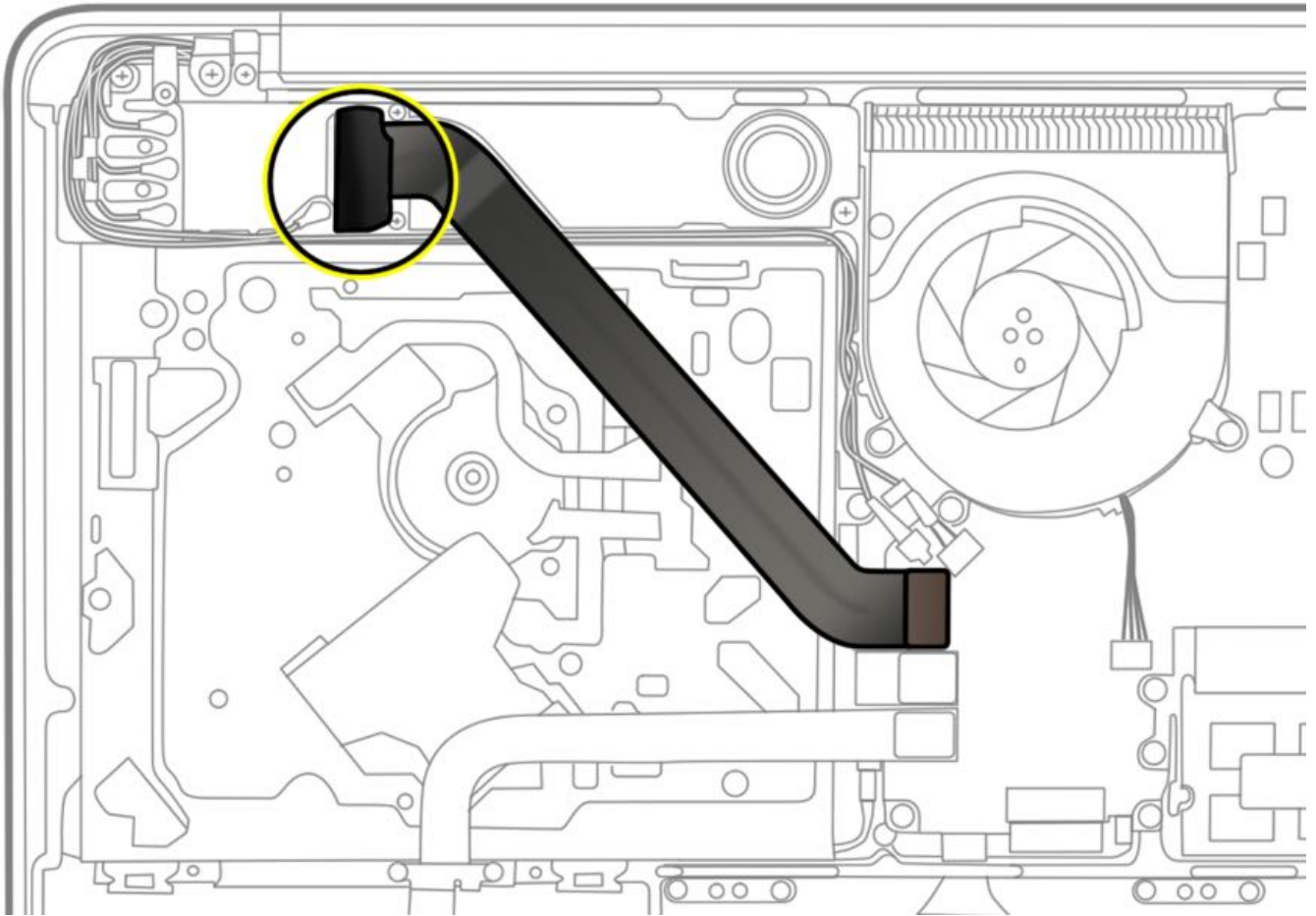




3. Install 3 screws (922- 9761 2.mm). Install AirPort/Bluetooth card in holder.



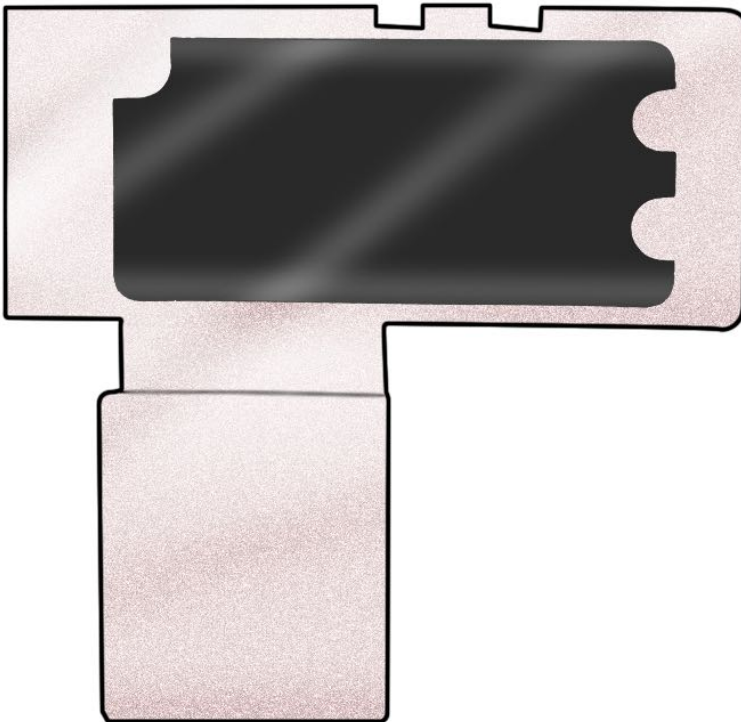
4. Connect AirPort/ Bluetooth flex cable to card.



5. Do the following to install replacement wrap:

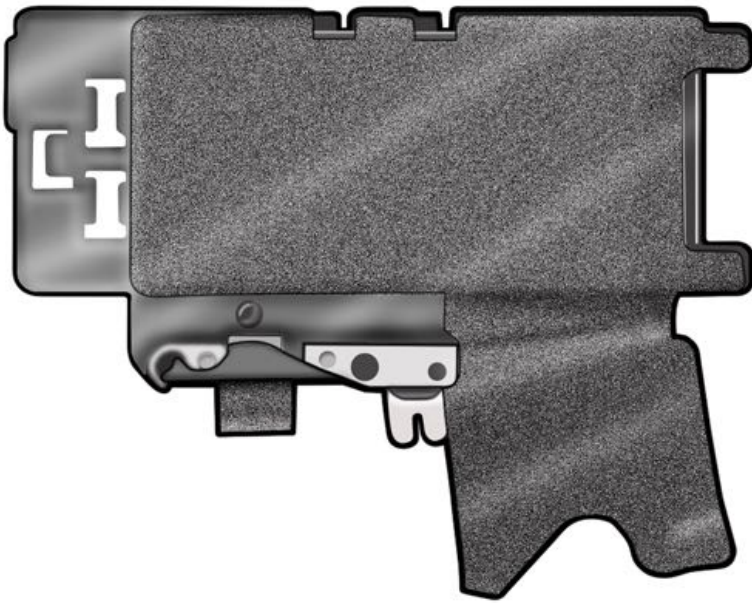
- Peel off larger bottom section of white protective backing from adhesive side of wrap.

**Caution:** Do not peel off black mylar.

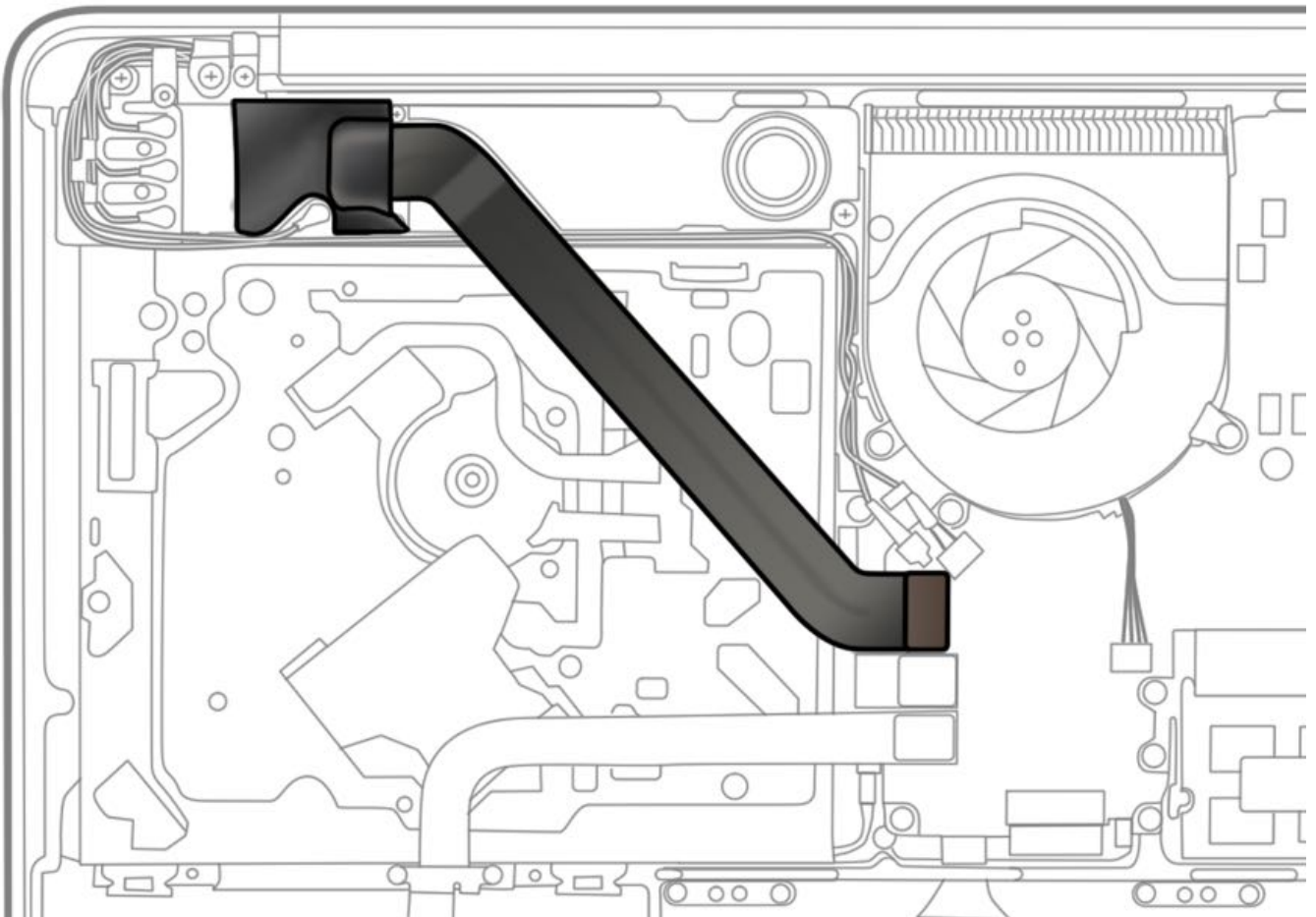


- Place wrap over AirPort/Bluetooth card. Smooth down edges of wrap around card so it adheres to holder.

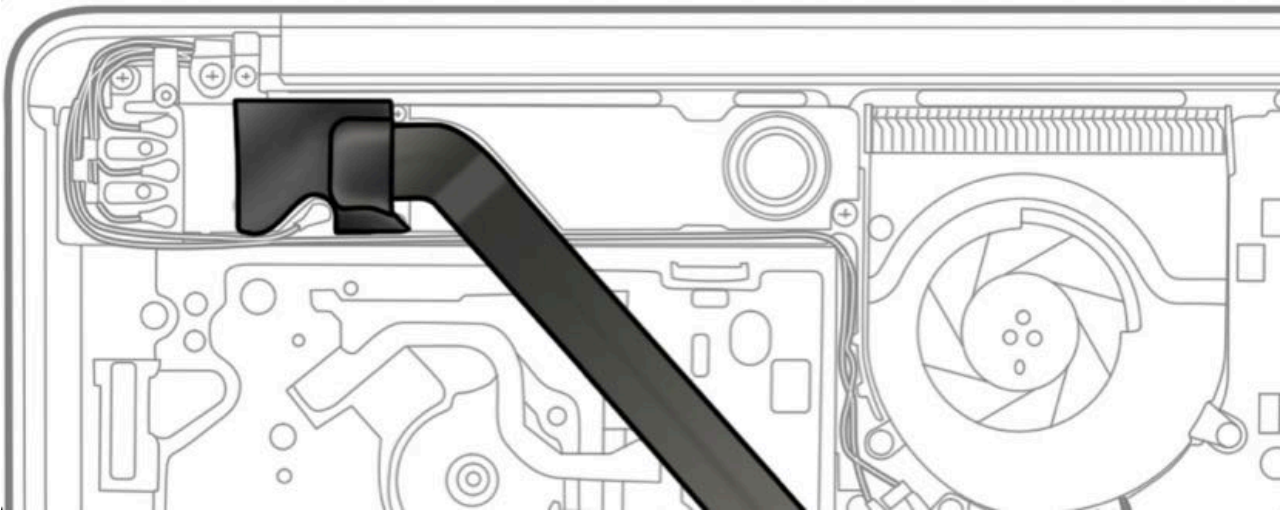
**Note:** Do not press on middle of wrap, as this may damage card.



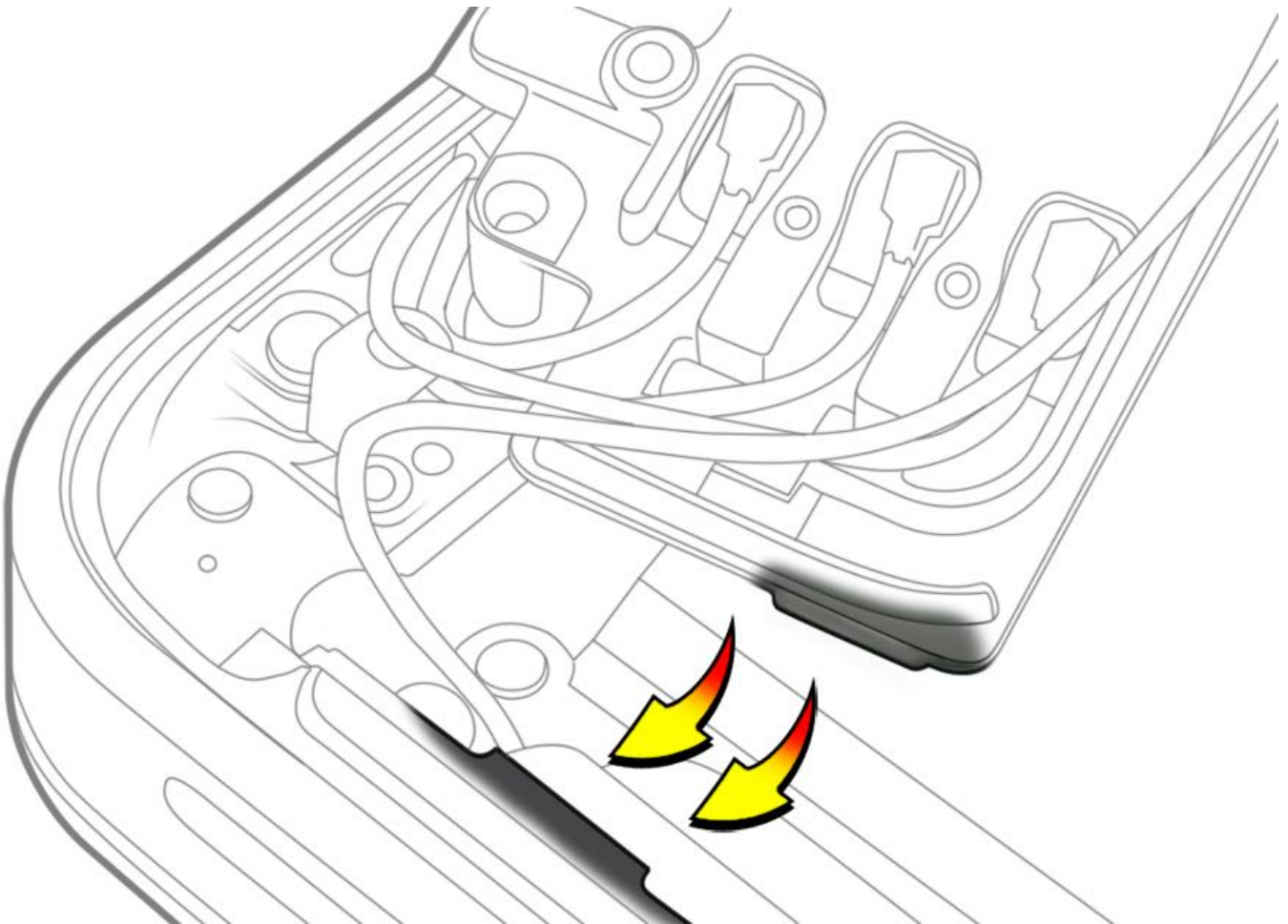
- Peel remaining backing from wrap. Secure wrap over edge and top side of holder, being careful to cover flex cable connector. Verify complete adhesion on all edges of wrap.



- Peel remaining backing from wrap. Secure wrap over edge and top side of holder, being careful to cover flex cable connector. Verify complete adhesion on all edges of wrap.

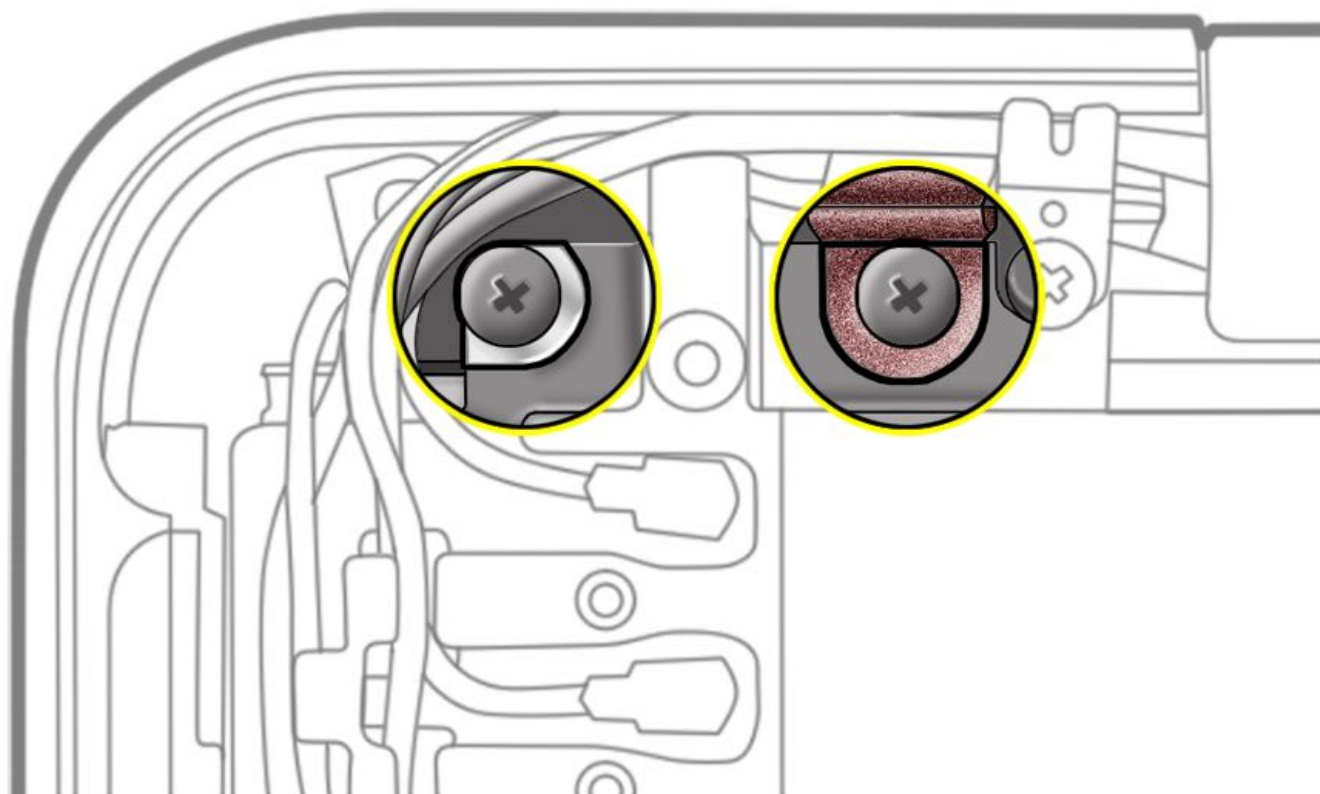


**Replacement Notes:** Make sure small tab on holder inserts under edge of black bracket on inside of top case. Tab is shown normal size in this drawing.



Be sure to install grounding cables over the carrier as shown.





# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Hard Drive

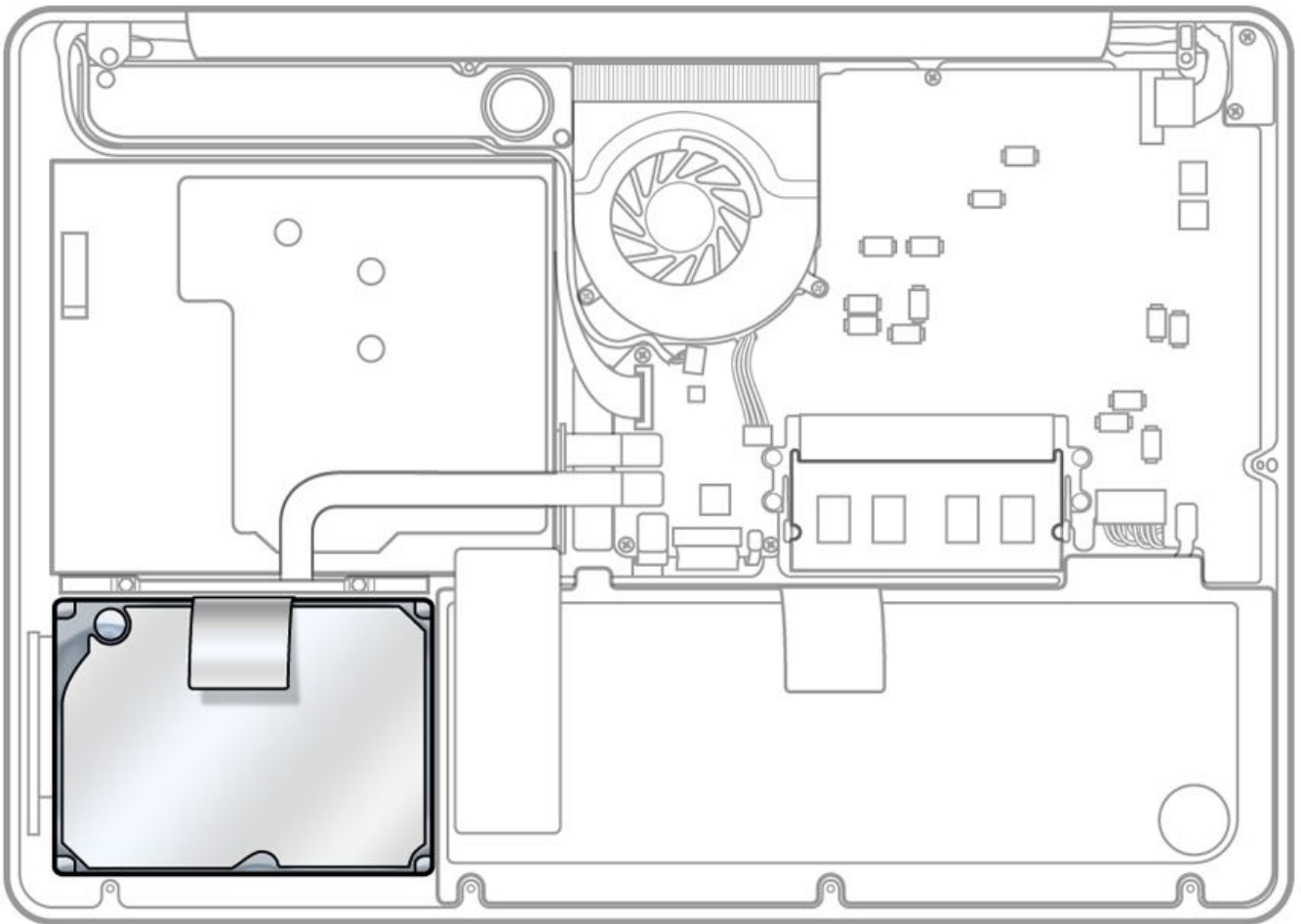
## First Steps

Remove

- [Bottom Case](#)
- [Rear Hard Drive Bracket](#)

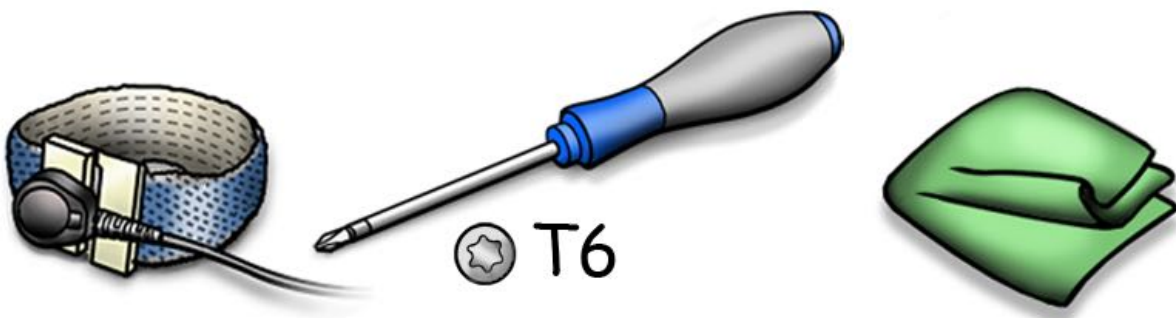


**Caution:** Make sure data is backed up before removing hard drive.



## Tools

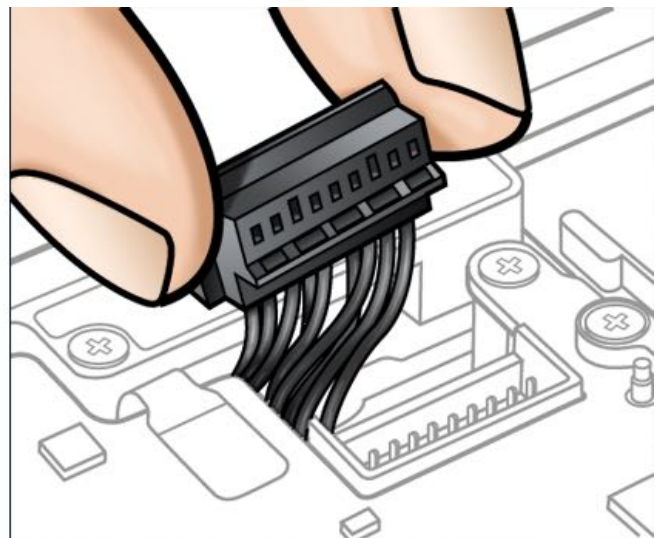
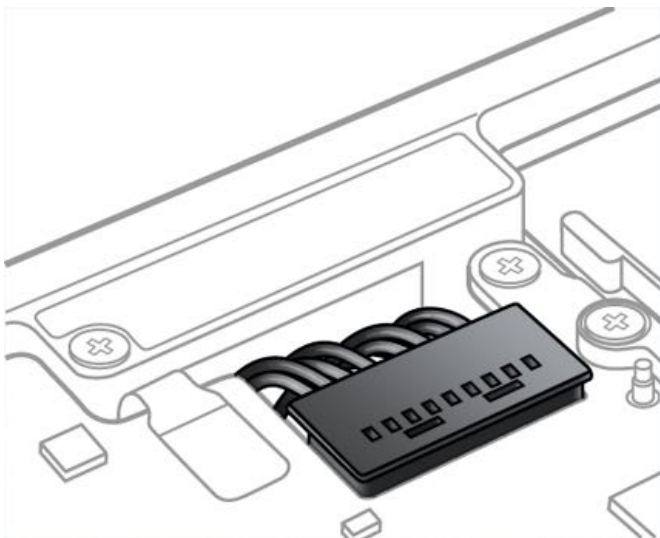
- ESD wrist strap
- Clean, soft, lint-free cloth
- Phillips #00 screwdriver, magnetized
- Torx T6 screwdriver, magnetized



## Steps For Removal



Before you begin this procedure, disconnect battery from logic board. Failure to do so could damage computer.



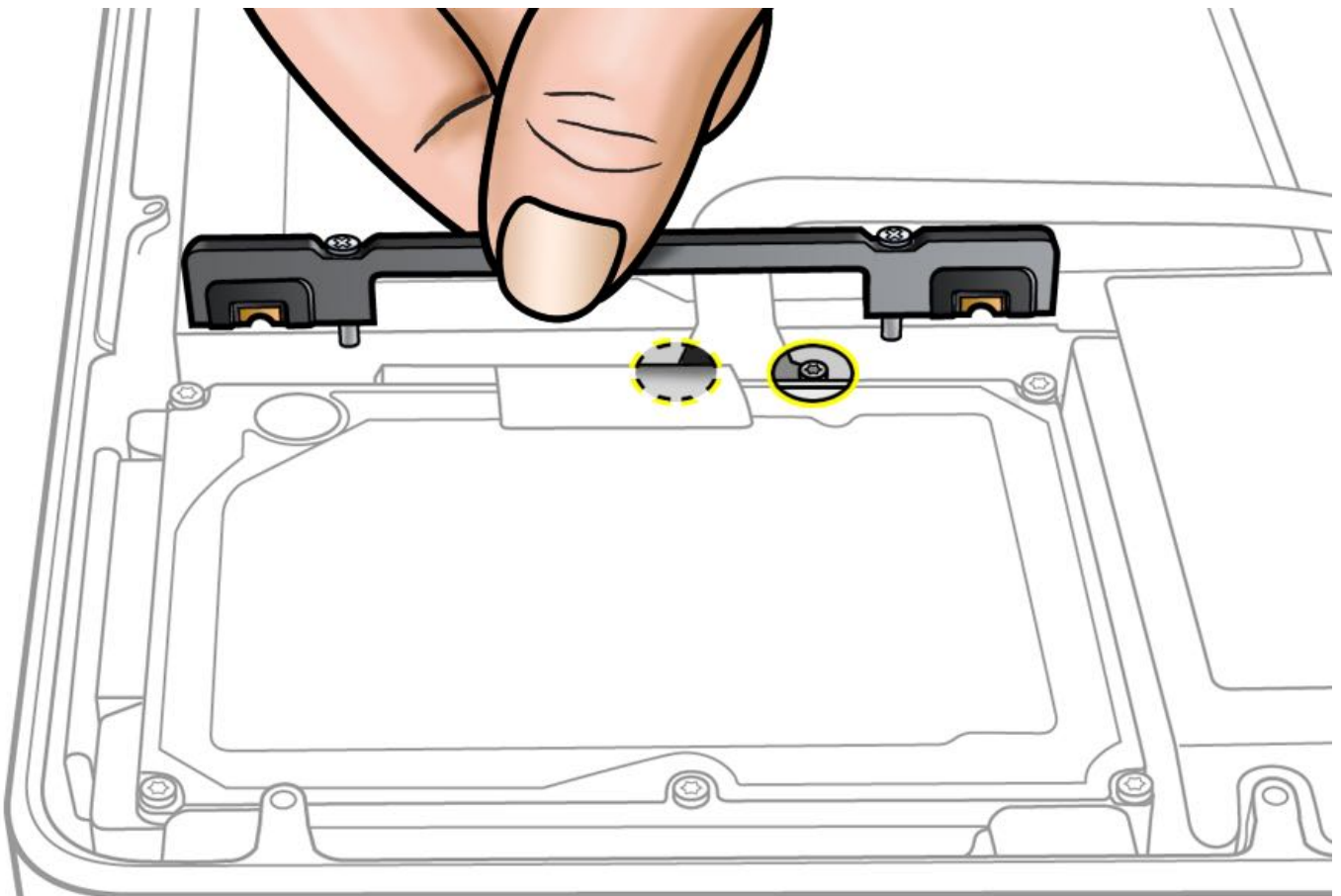
1. Inspect rear hard drive bracket for presence of foam pad. If no foam pad is present.

Install a foam pad. (Part # 073-1435).

Install pad on top of rear hard drive bracket directly above hard drive cable.



1. Make sure rear hard drive bracket has been removed.

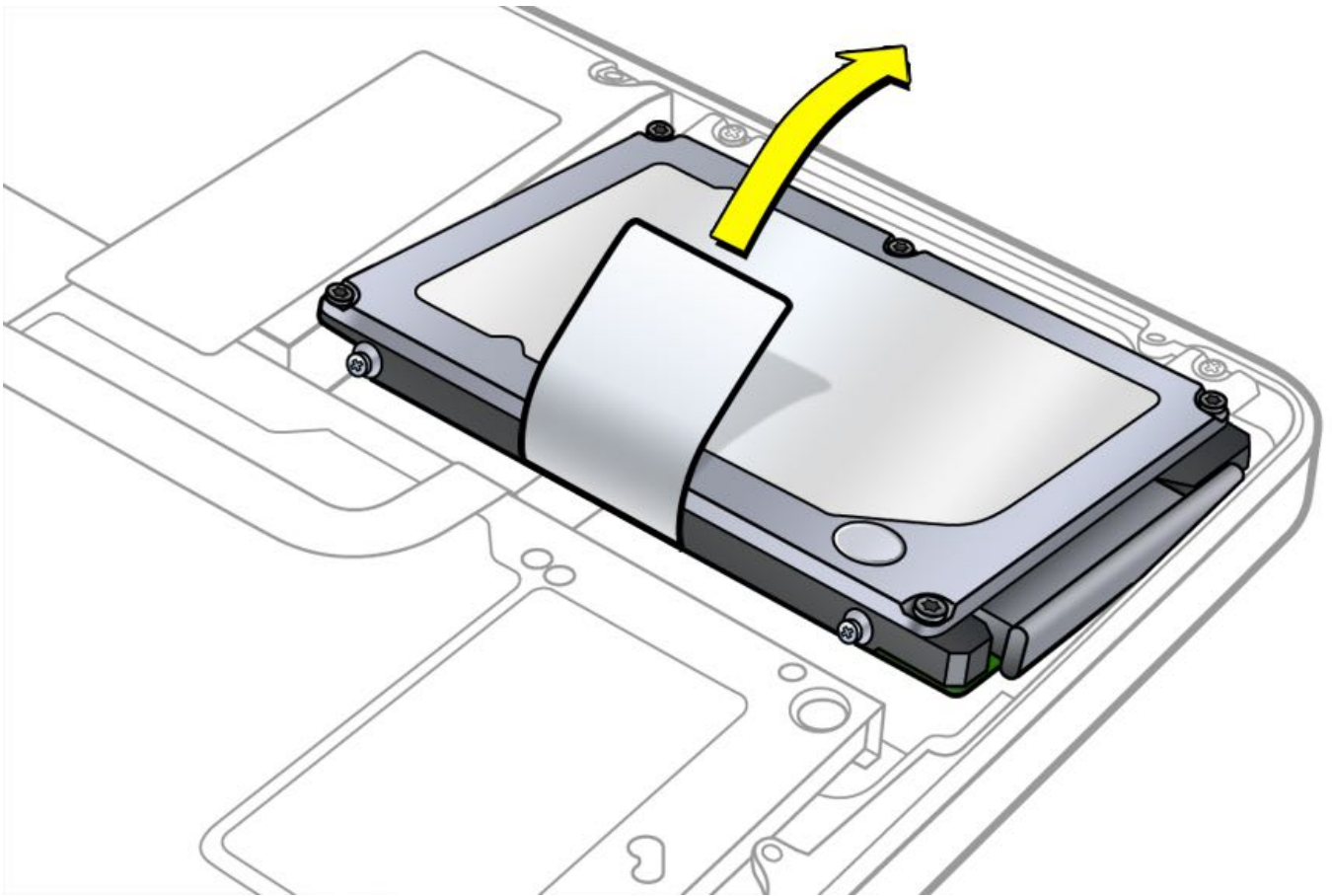


2. Use pull tab to tilt hard drive up.



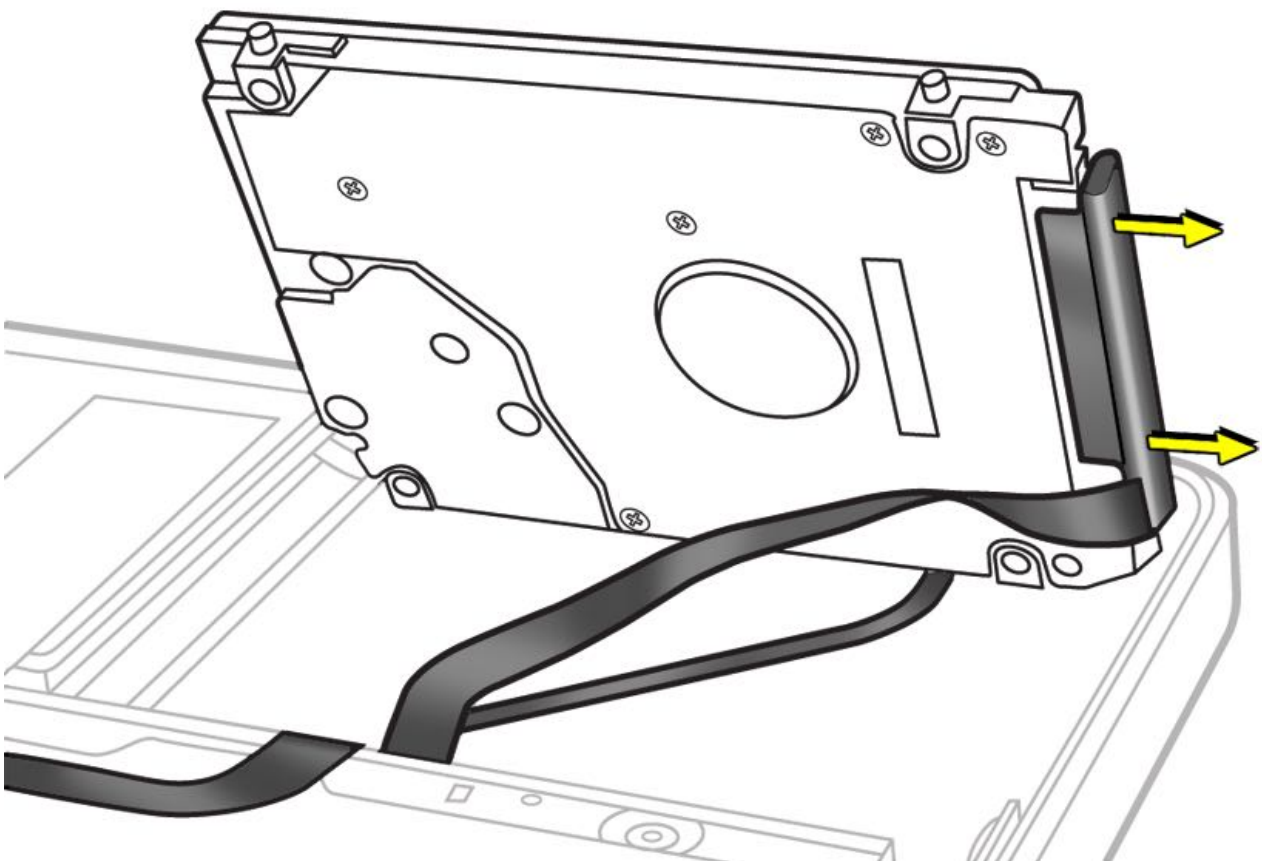
Be careful not to pull too far or too fast. There is a delicate flex cable running underneath drive.





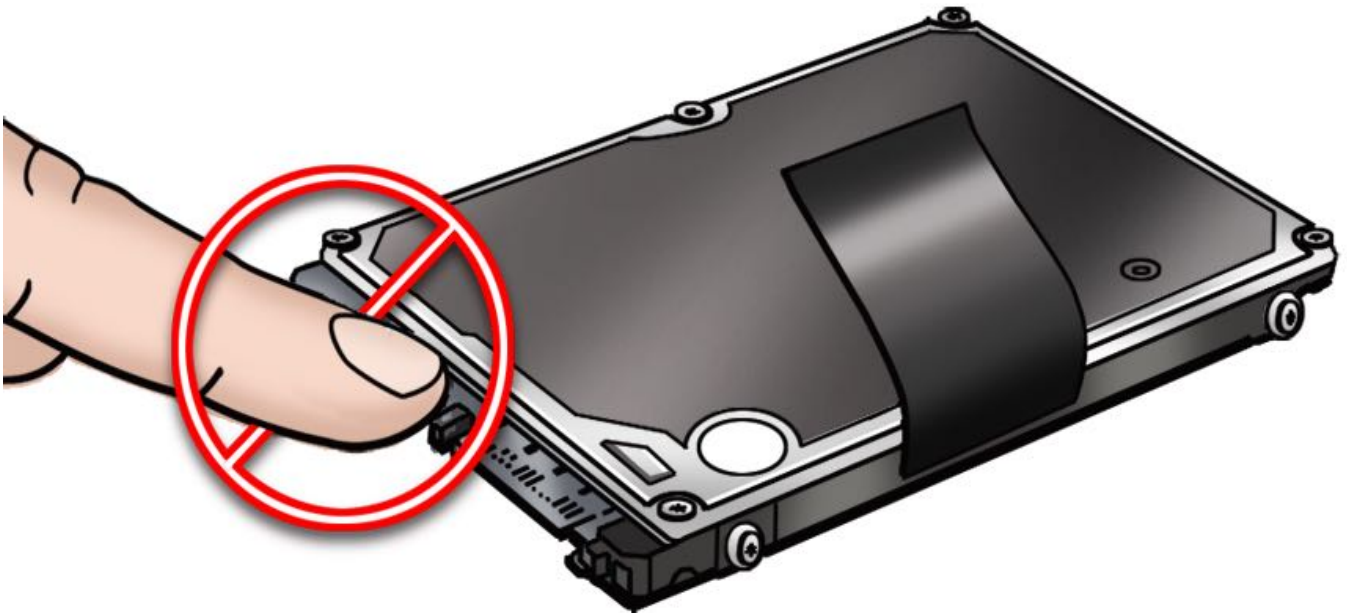
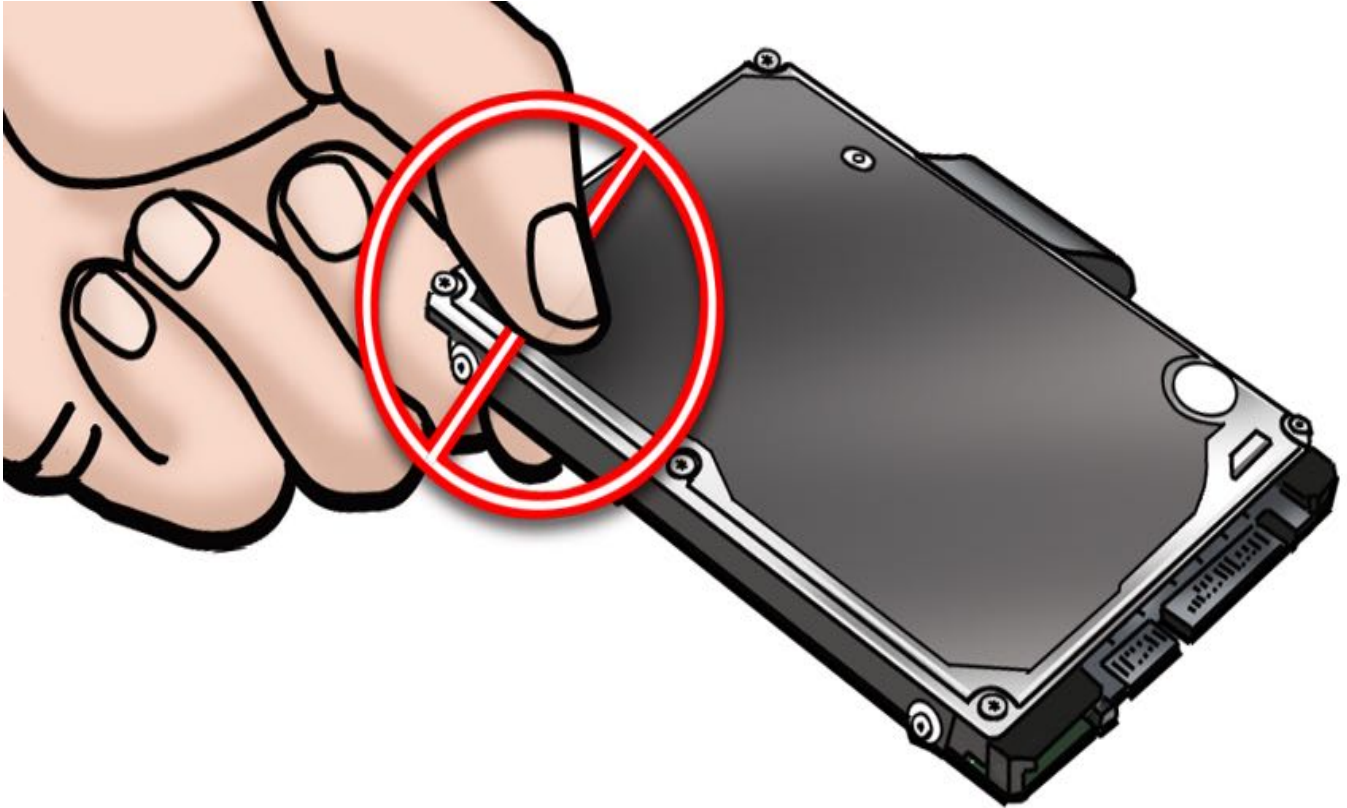
3. Note flex cable underneath hard drive. Be careful not to strain cable.

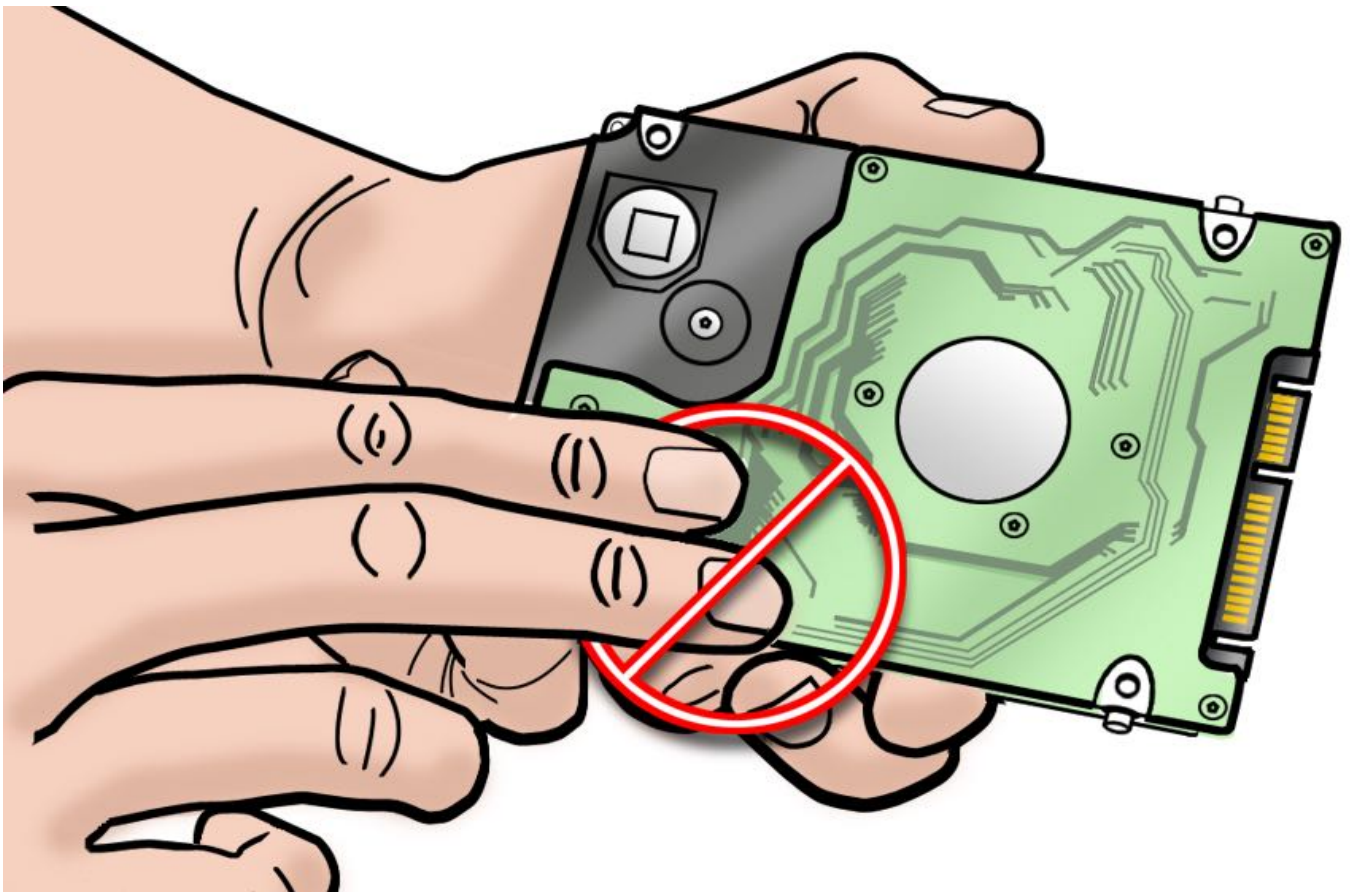
4. Disconnect hard drive flex cable connector.



5. Follow safe handling of hard drive:

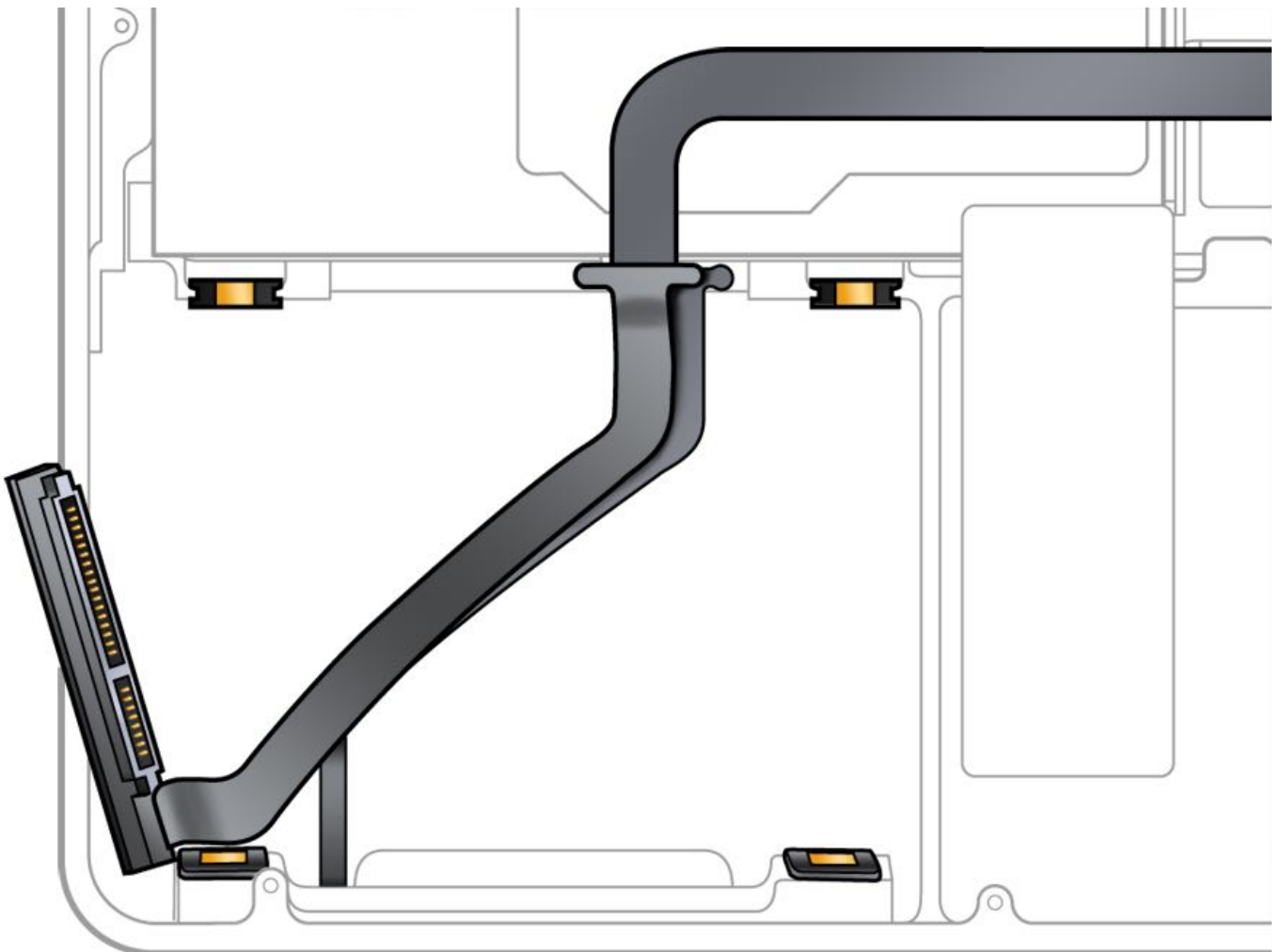
- Hold by sides only.
- Do not press drive.
- Do not touch connector.
- Do not touch circuitry.





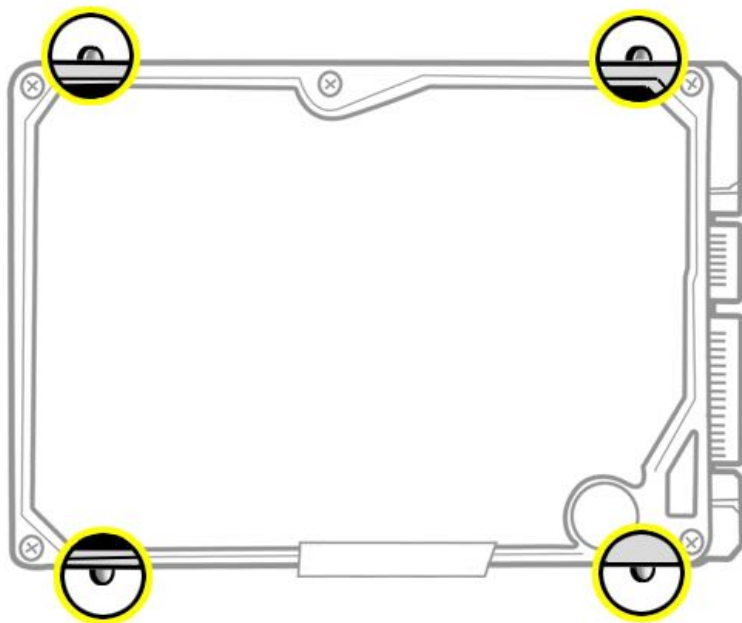
### Steps For Reassembly

1. Make sure 4 orange and black rubber grommets are installed in top case before installing hard drive.



2. Make sure (4) T6 mounting screws are installed on drive.

Replacement drive should include mounting screws, but if not, transfer them from old drive.



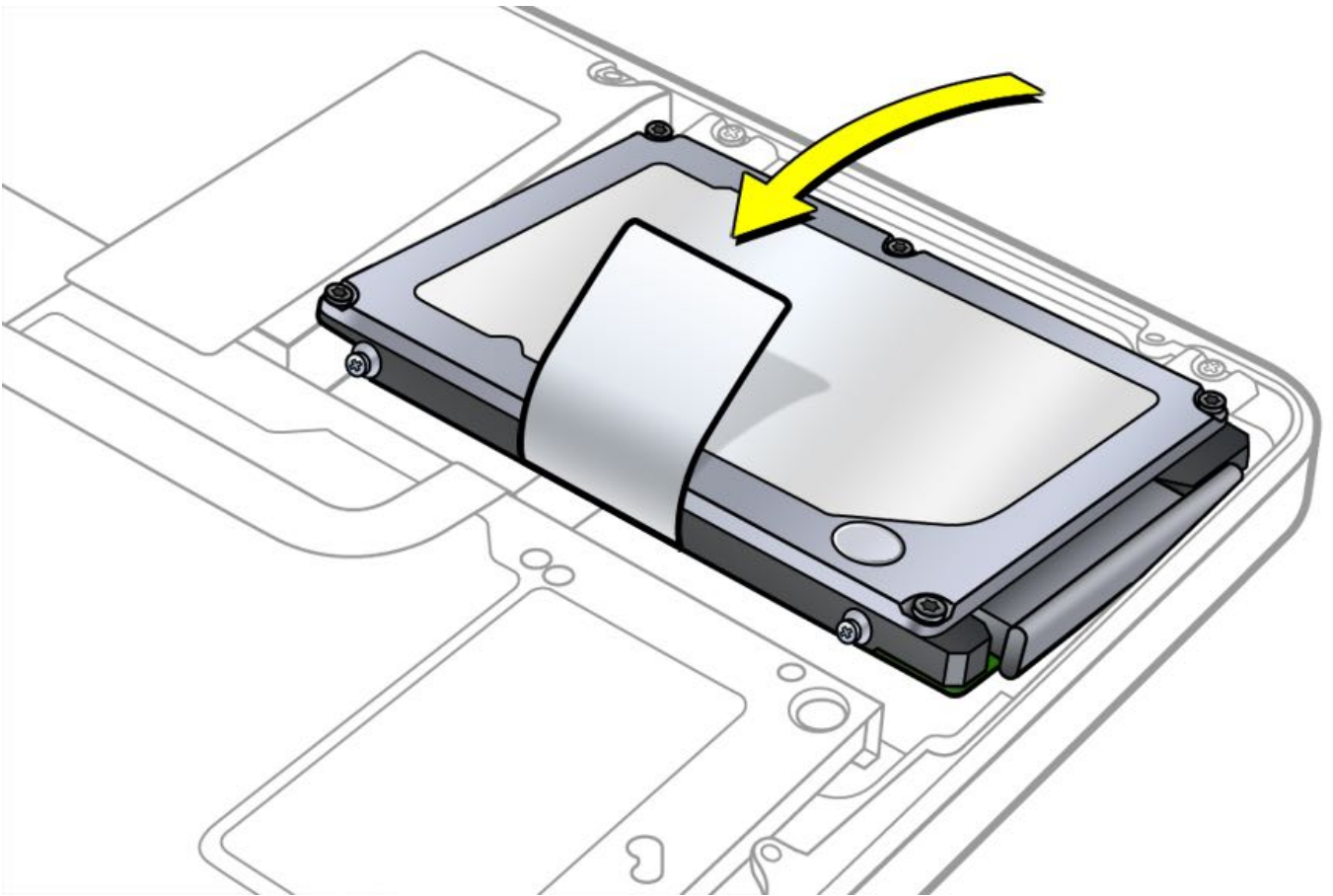
**Note:** If you need to attach a pull tab to a hard drive, hold the drive on its side with the connector facing away from you, as shown. Attach the pull tab to the side of the drive, 2 inches (50.8 mm) from the connector end. If a warranty label is present, make sure the pull tab does not cover the label.





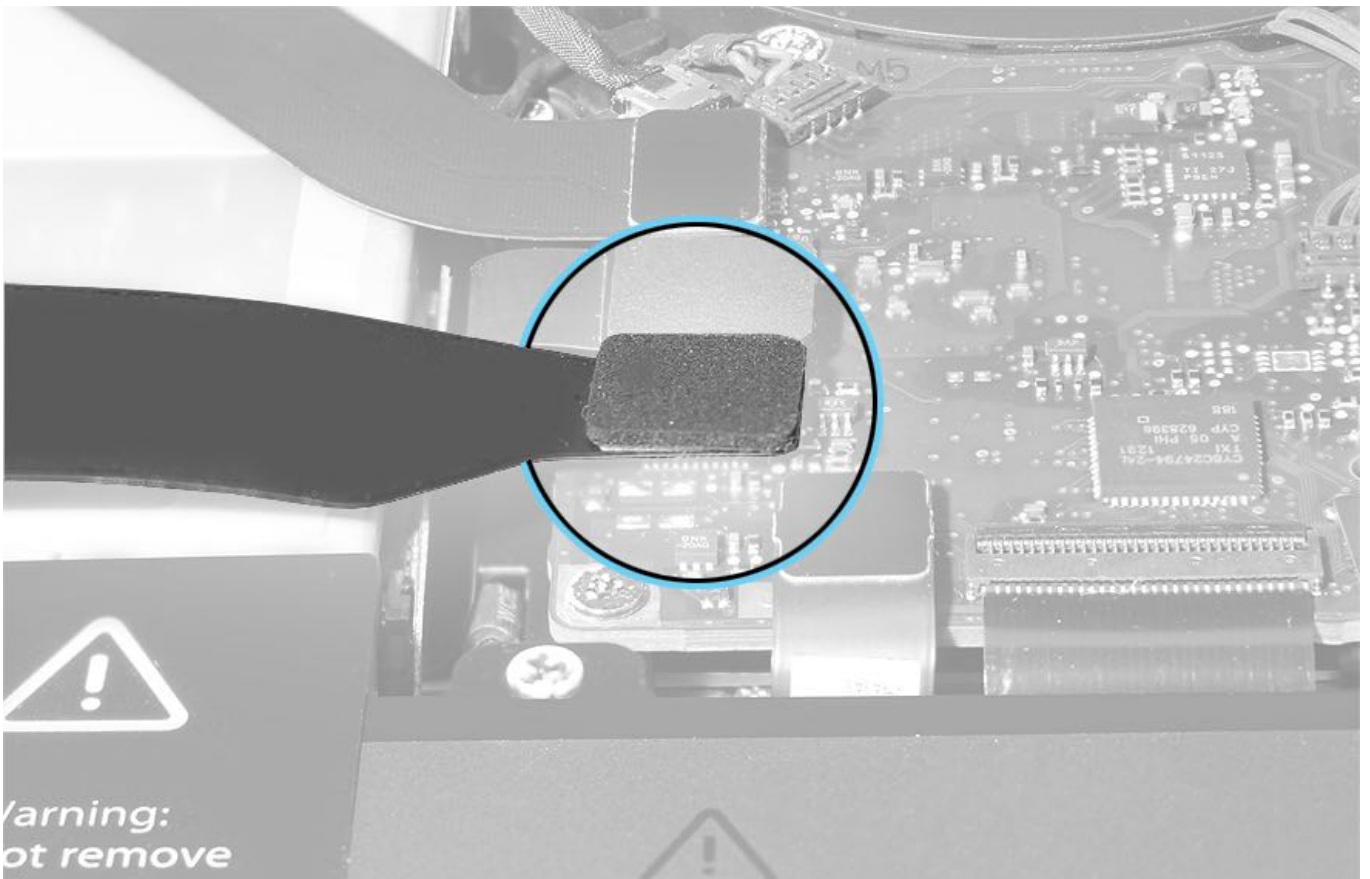
3. Attach flex cable connector and tilt hard drive into top case.

4. Install rear hard drive bracket and tighten captive screws.



**For Mid 2012 model only:**

Check that a foam pad is included on the hard drive flex cable at the logic board side. If it is not included, attach the pad to the cable. Foam pads are available in packages of 10 (923-0002) or packages of 50 (923-0003).



# Portables and Desktops Late 2011 or later: Reinstalling Software That Came with the Computer

Refer to Apple Support article [HT4718: OS X: About OS X Recovery](#).

Connection to the Internet is required to complete this procedure.

**Important:** Apple recommends backing up data before restoring software. Back up essential files before installing OS X and other applications. Apple is not responsible for any loss of data.

1. Choose Apple menu > Restart, and then hold down the Command (⌘) and R keys while your computer restarts.  
**Note:** To force OS X Lion or OS X Mountain Lion into Internet Recovery, press and hold the Command-Option-R key combination when starting up the computer.
2. If you're not connected to the Internet, choose a network from the Wi-Fi menu (in the top-right corner of the screen).
3. Select reinstall OS X, and then click Continue.
4. Follow the onscreen instructions. In the pane where you select a disk, select your current OS X disk (in most cases, it is the only one available).
5. To start the installation, click Install.

Check for and apply the latest software and firmware updates.

# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Front Hard Drive Bracket

## First Steps

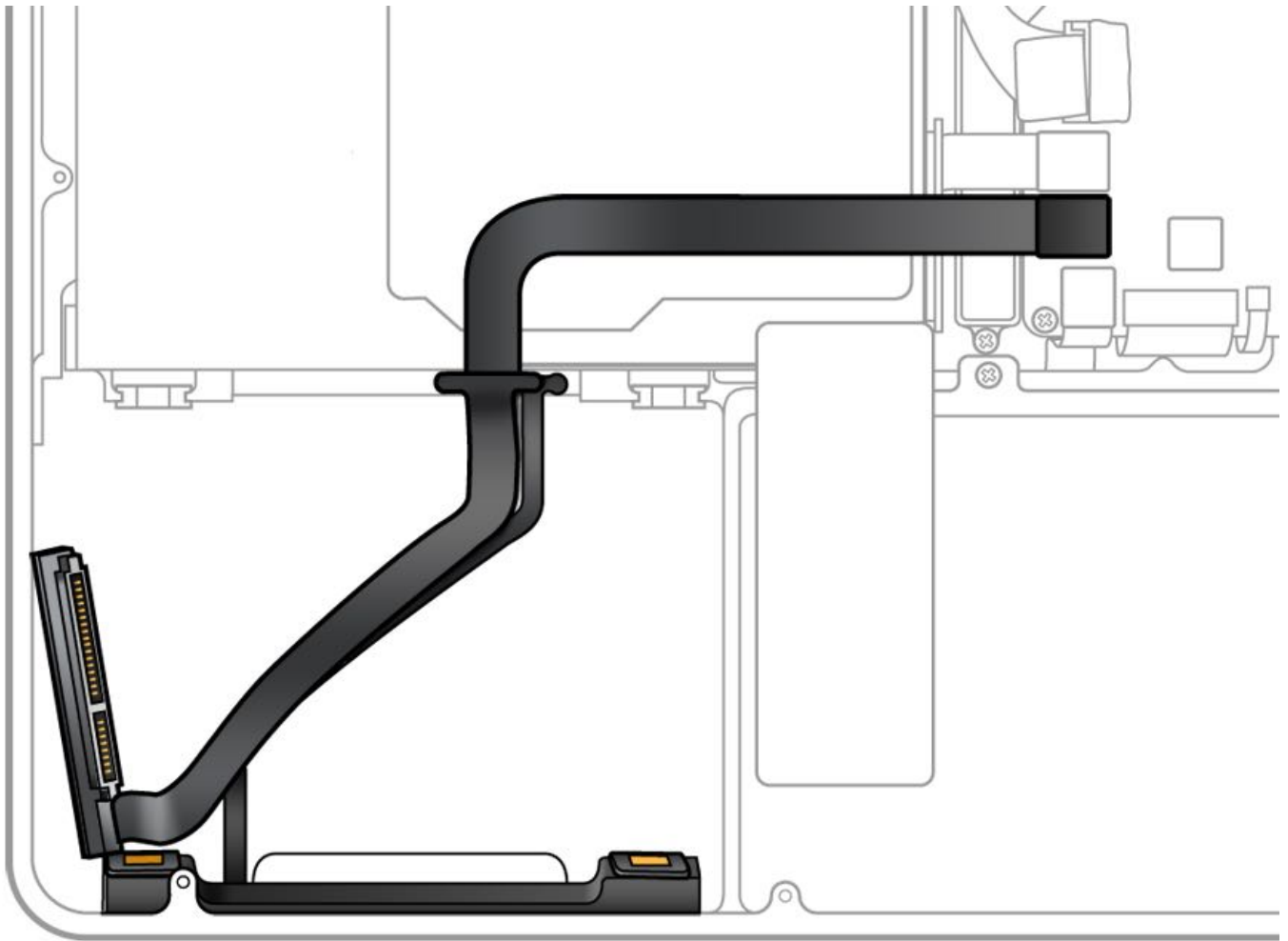
Remove:

- [Bottom Case](#)
- [Rear Hard Drive Bracket](#)
- [Hard Drive](#)

**Note:** The front hard drive bracket includes a combination flex cable for:

- Hard drive
- IR sensor/sleep LED indicator

**Caution:** Be careful when handling flex cable. Do not flatten or reshape flex cable bends, and avoid moving cable unnecessarily. Repeated movement at cable bends may damage internal wiring and require cable replacement.



## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Black stick
- Phillips #00 screwdriver, magnetized



### Steps For Removal

1. Disconnect cable from logic board.
2. Remove Phillips #00 screws at flex cable:

(2) 922-9036 (1.5mm)

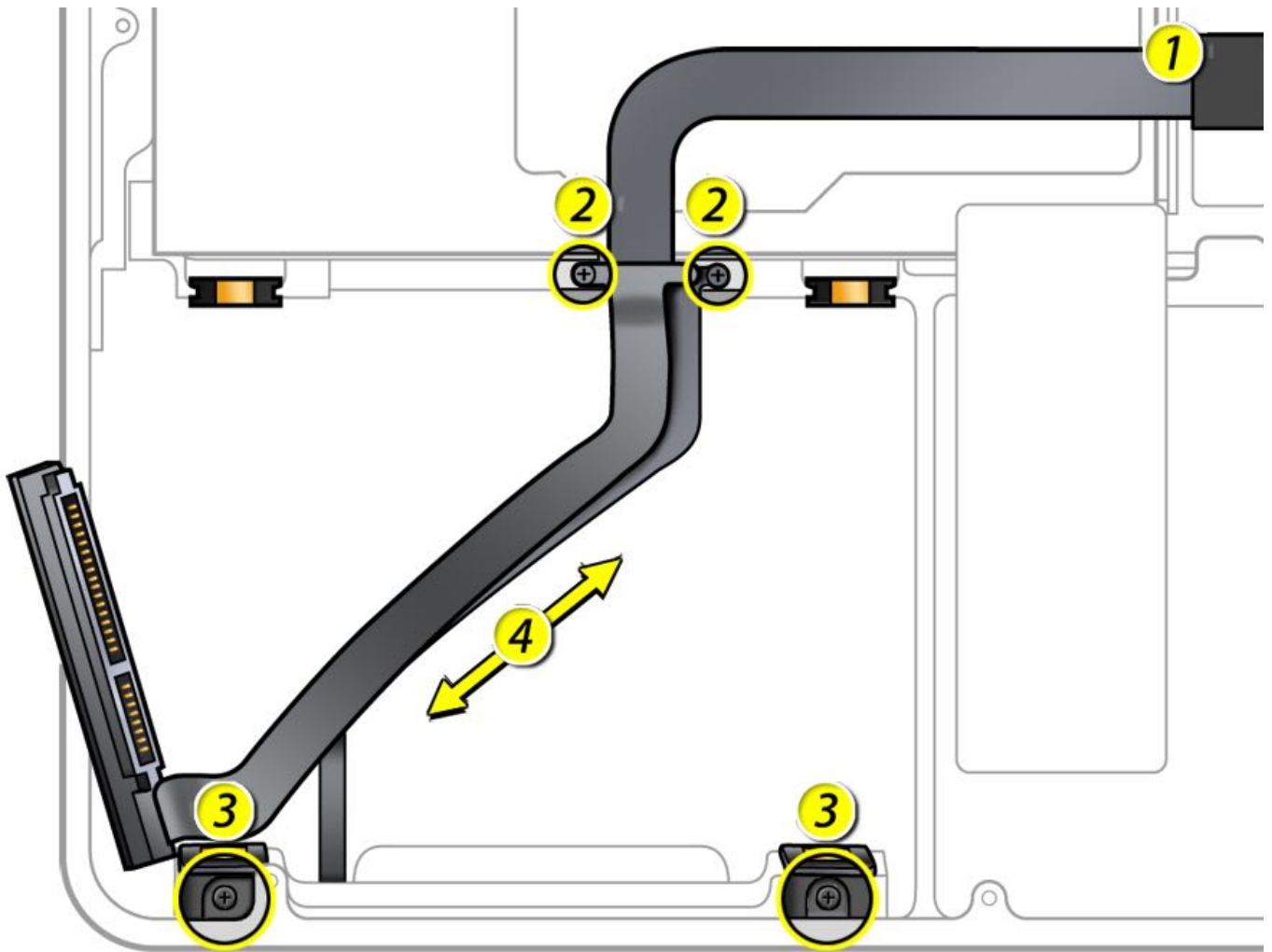


3. Remove Phillips #00 screws at front hard drive bracket:

(2) 922-9105 (4mm)



4. Peel up IR sensor/sleep LED cable from adhesive on top case.

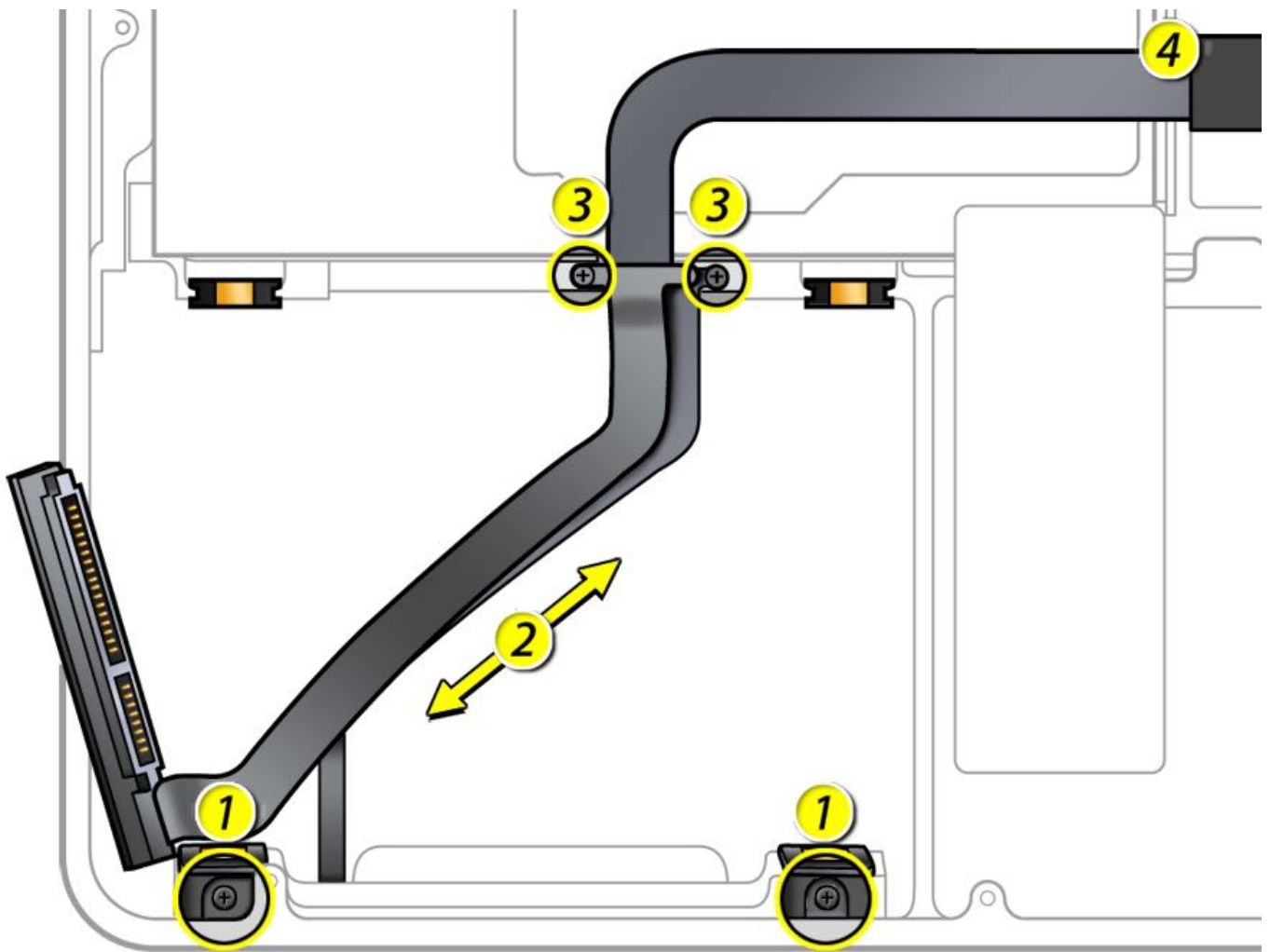


### Steps For Reassembly

1. Insert front hard drive bracket screws.
2. Press flex cable adhesive to top case.
3. Insert flex cable screws.
4. Attach flex cable to logic board.

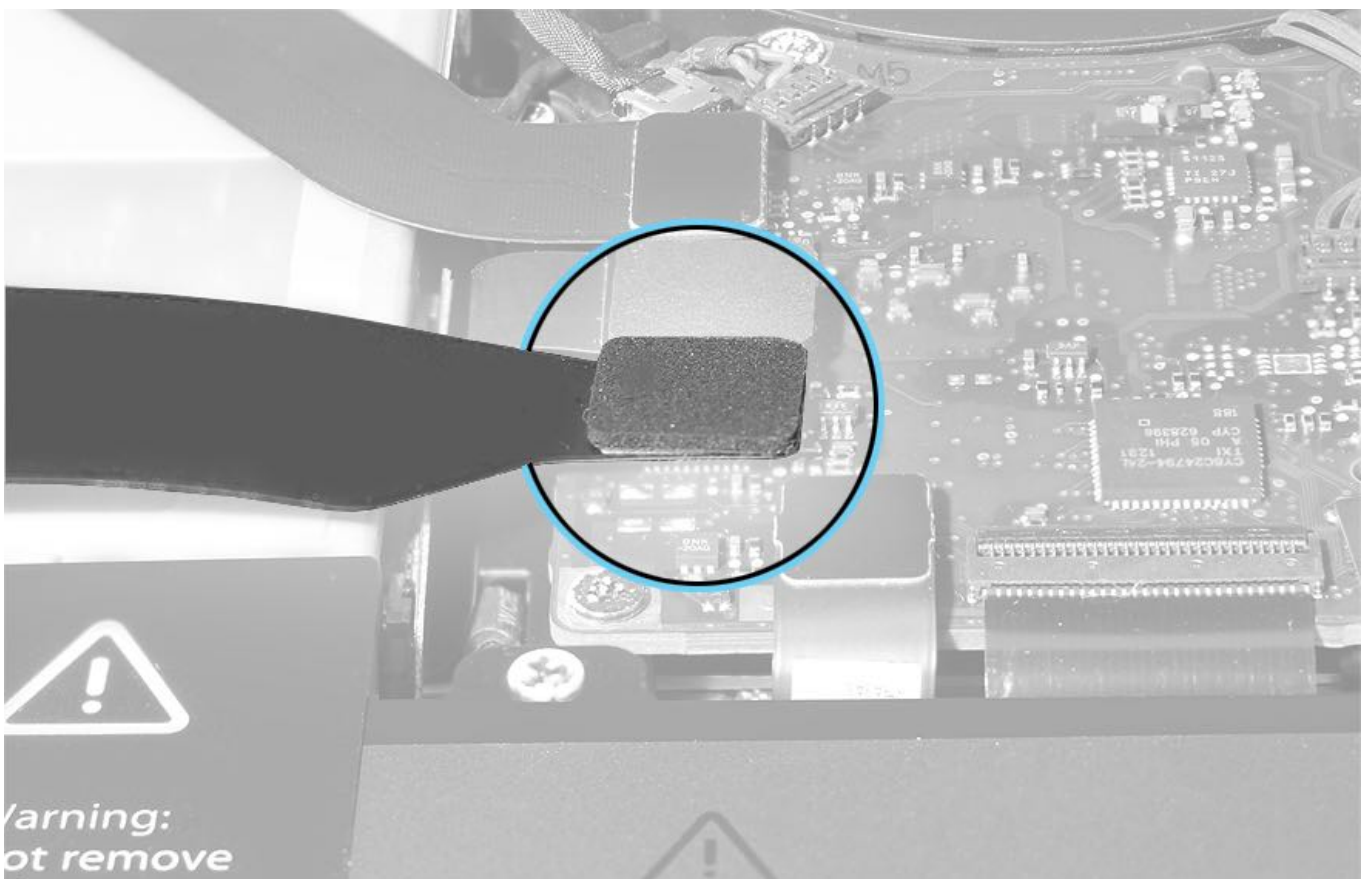
**Note:** Press cable straight down when installing. Be careful not to bend the cable.





**For Mid 2012 model only:**

Check that a foam pad is included on the hard drive flex cable at the logic board side. If it is not included, attach the pad to the cable. Foam pads are available in packages of 10 (923-0002) or packages of 50 (923-0003).

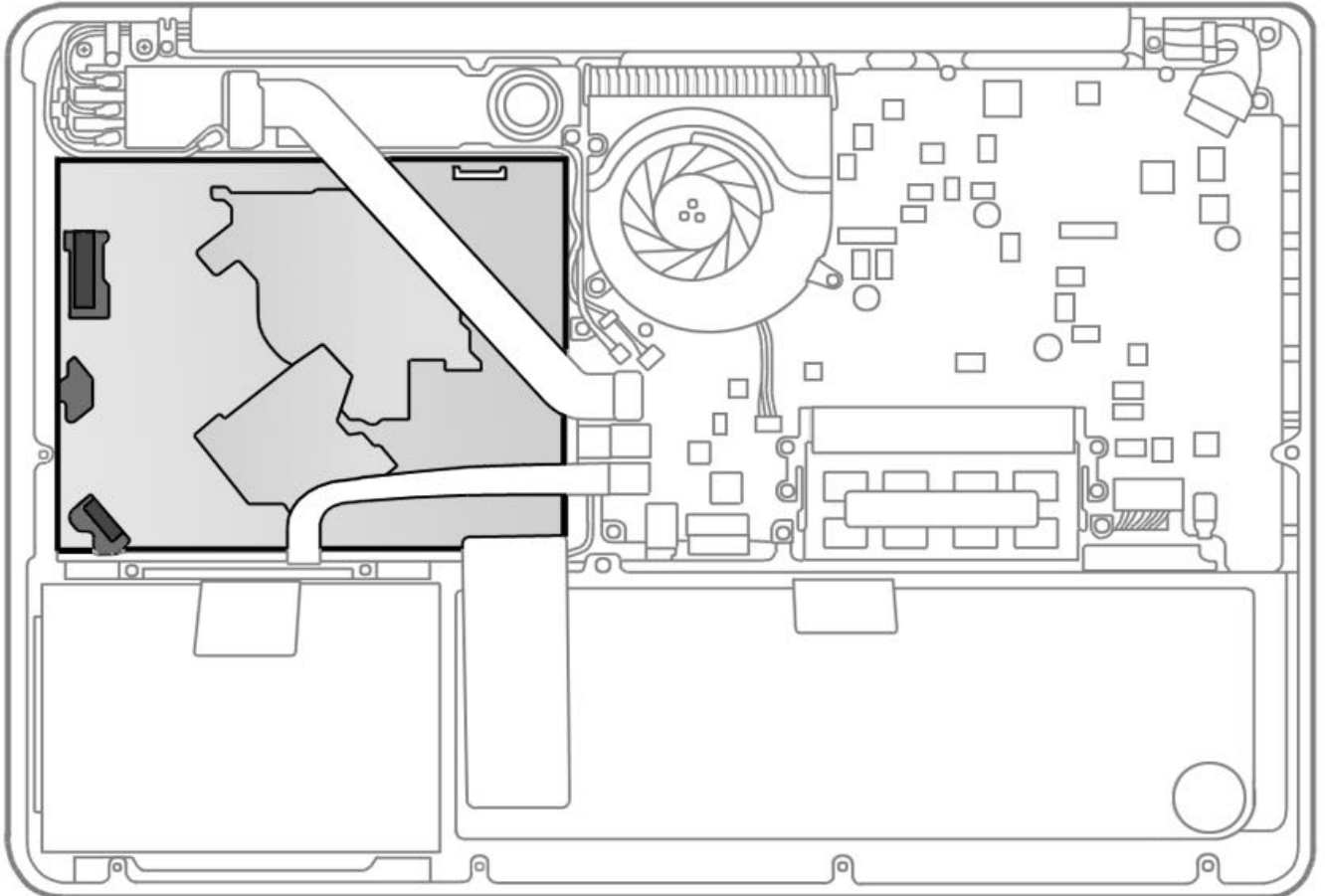


# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Optical Drive

## First Steps

Remove:

- [Bottom Case](#)
- [Battery](#)
- [AirPort/Bluetooth Flex Cable](#)
- Move [AirPort/Bluetooth Card](#) slightly to the right
- [Rear Hard Drive Bracket](#)
- Remove [Hard Drive](#) flex cable screws



## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Black stick
- Phillips #00 screwdriver, magnetized

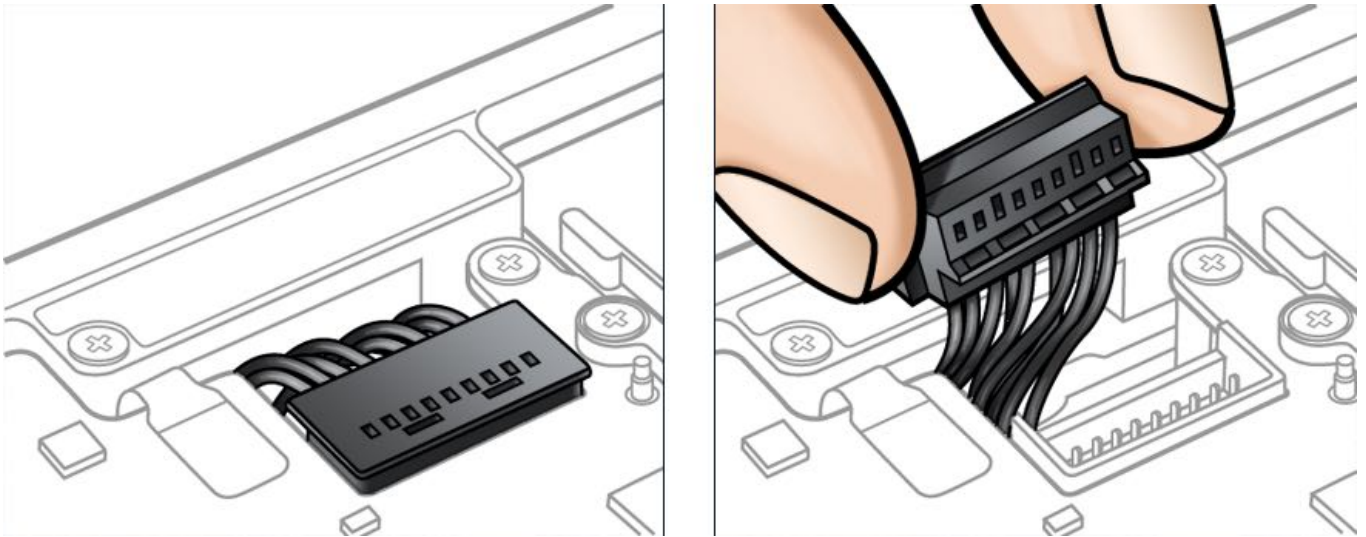


## Steps For Removal



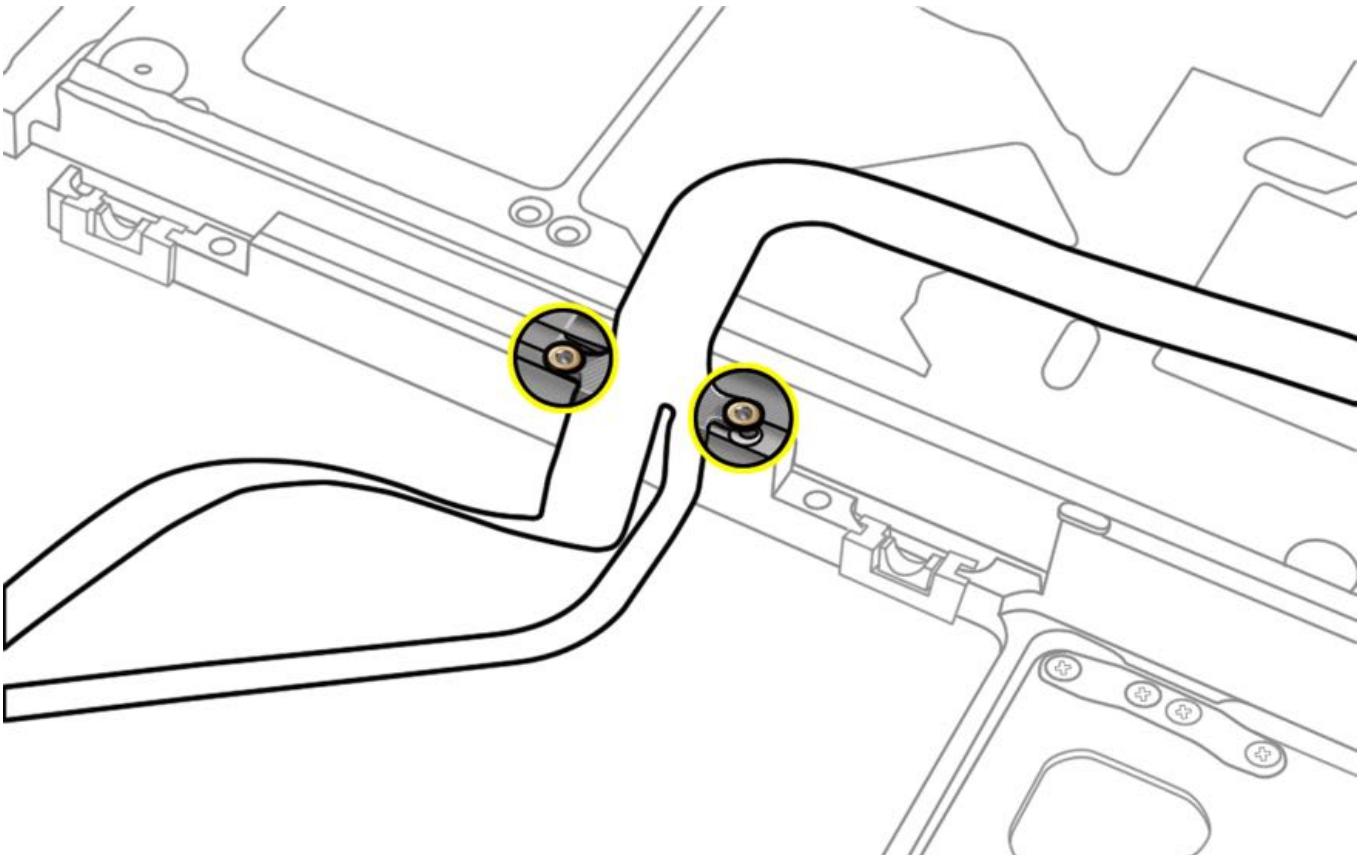


Before you begin this procedure, disconnect battery from logic board. Failure to do so could damage computer.



1. Remove hard drive rear bracket and remove hard drive flex cable screws. This allows more freedom for the flex cable when you remove the optical drive.

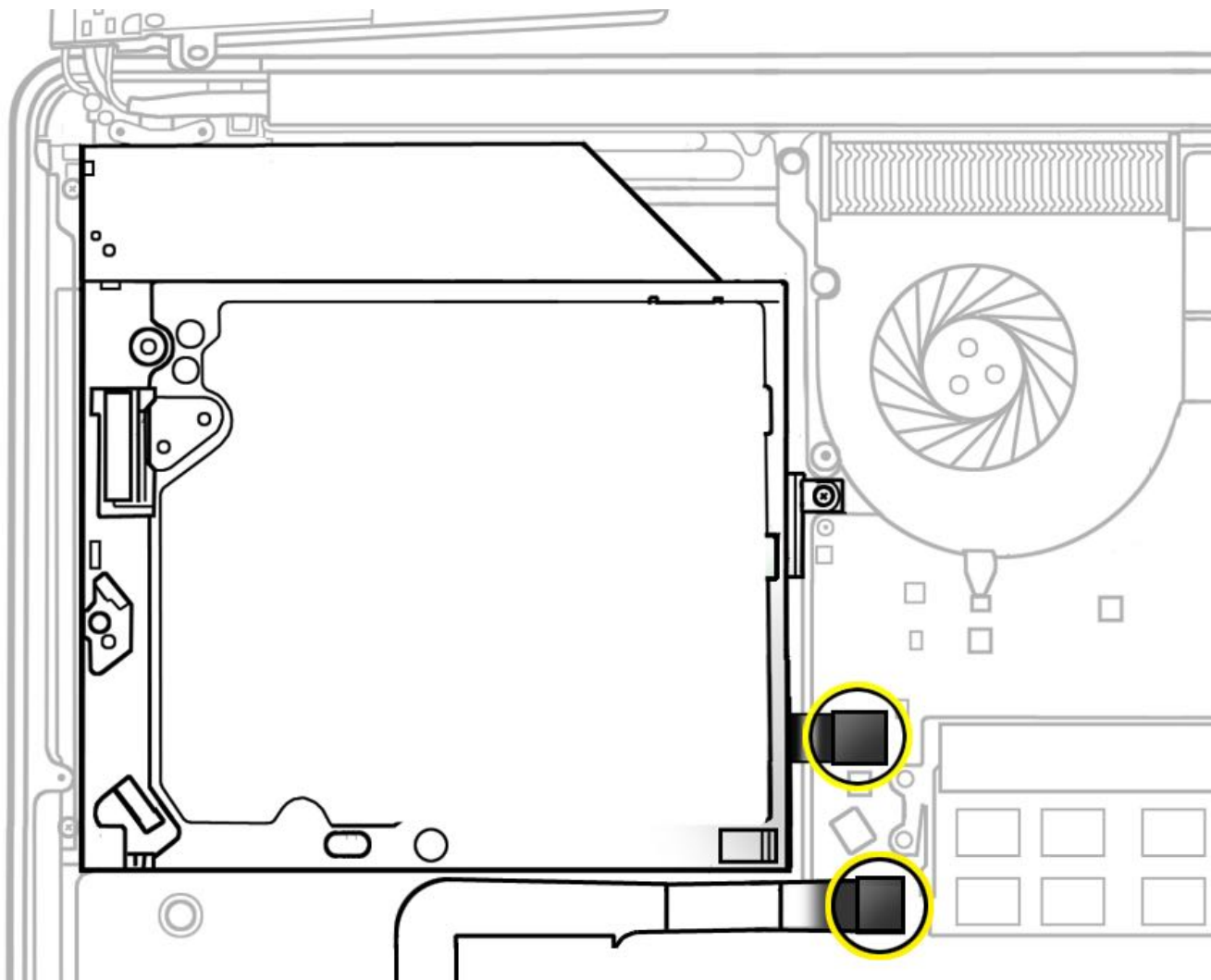
**Caution:** Take care moving the flex cable. Do not move, reshape or bend it back more than 90 degrees. Excessive handling may damage copper tracing within the cable and require cable replacement.



2. Use black stick to carefully disconnect 2 flex cables from logic board:

- optical drive
- hard drive

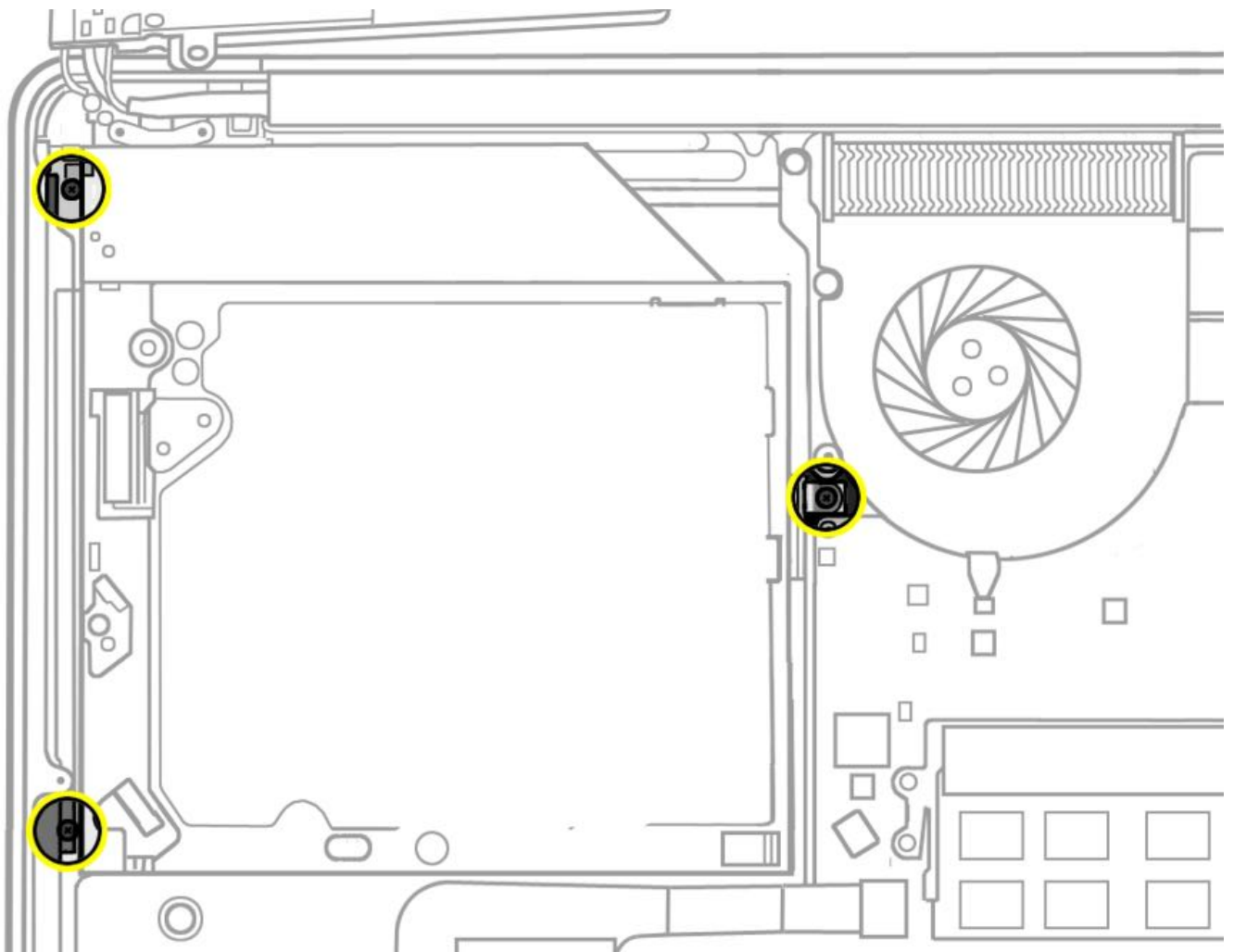
**Reassembly Note:** Press cables straight down when installing.



3. Remove Phillips #00 screws:

(3) 922-8662 (2.8mm)

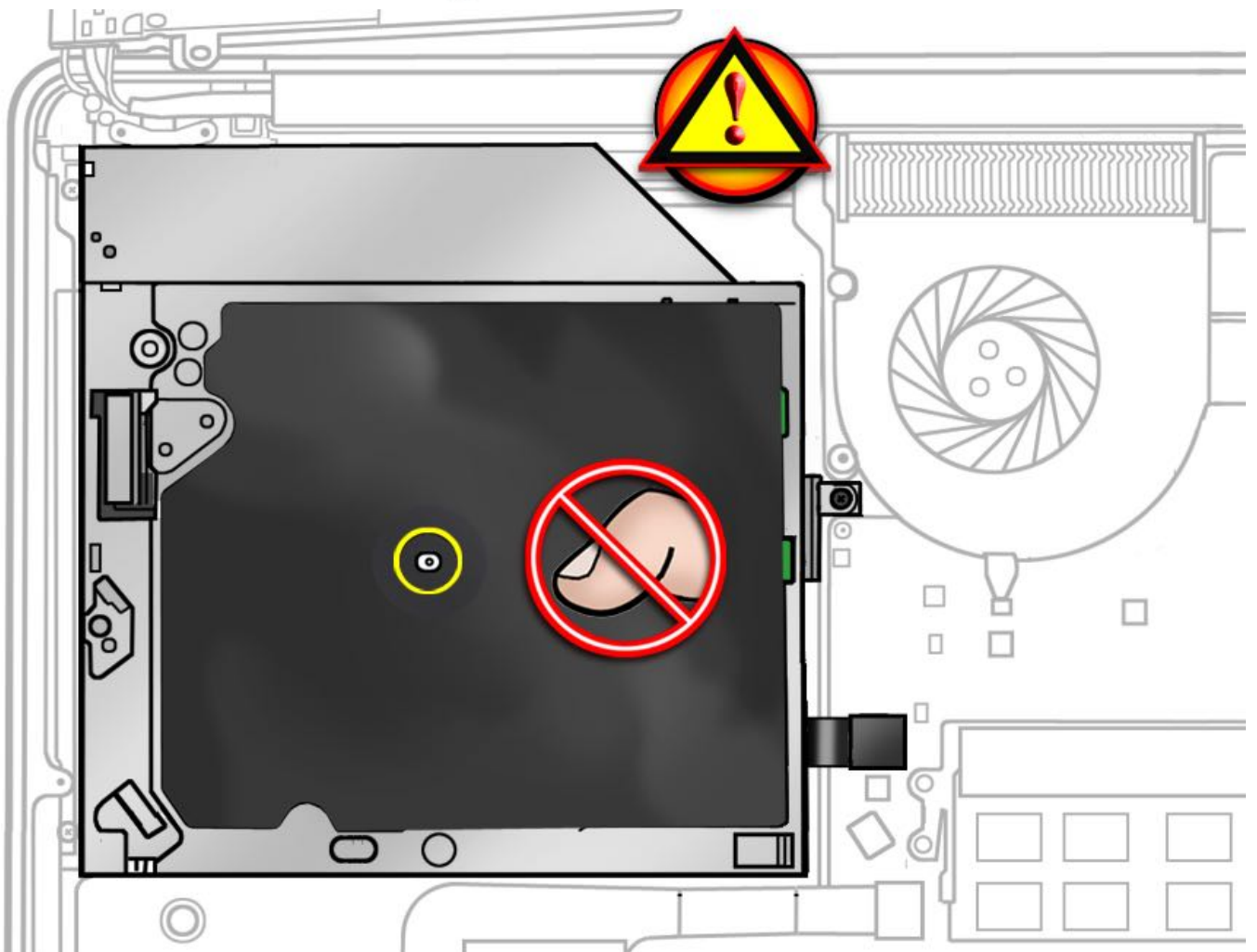
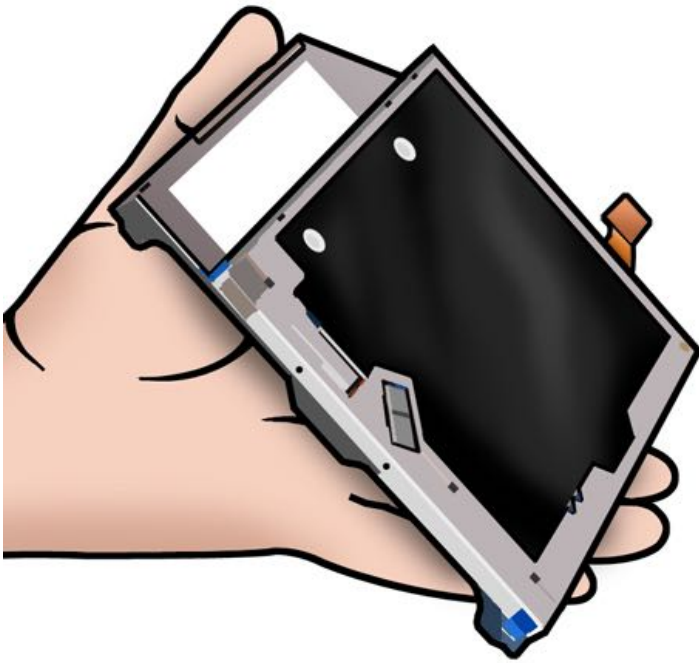




4. **Replacement Note:** If installing a new optical drive, transfer short flex cable from old drive to new drive.

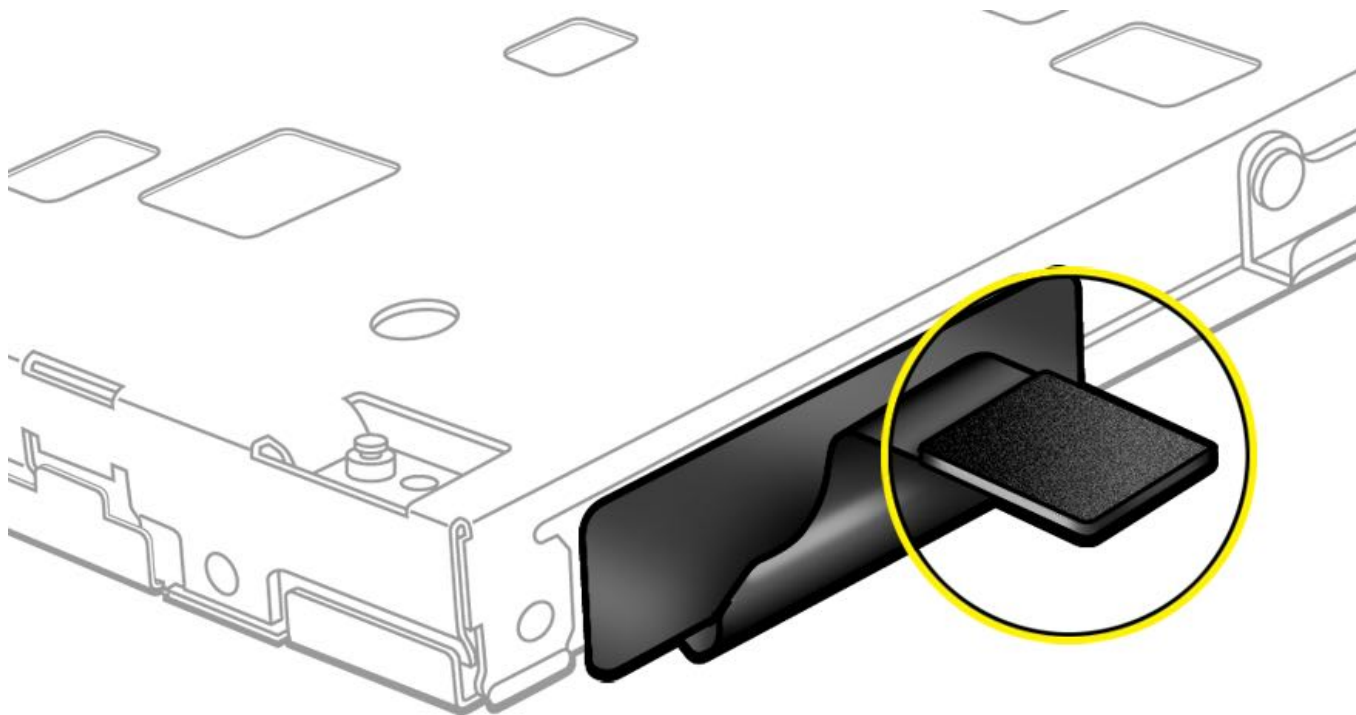
**Important:** Handle drive by sides only. Do not press or squeeze the top or bottom of optical drive

**Important:** Do not touch sensor on top case underneath optical drive.



## Steps For Reassembly

**Reassembly Note for Early 2011:** Apply the foam pad included with the replacement cable to the top of the cable connector, as illustrated.

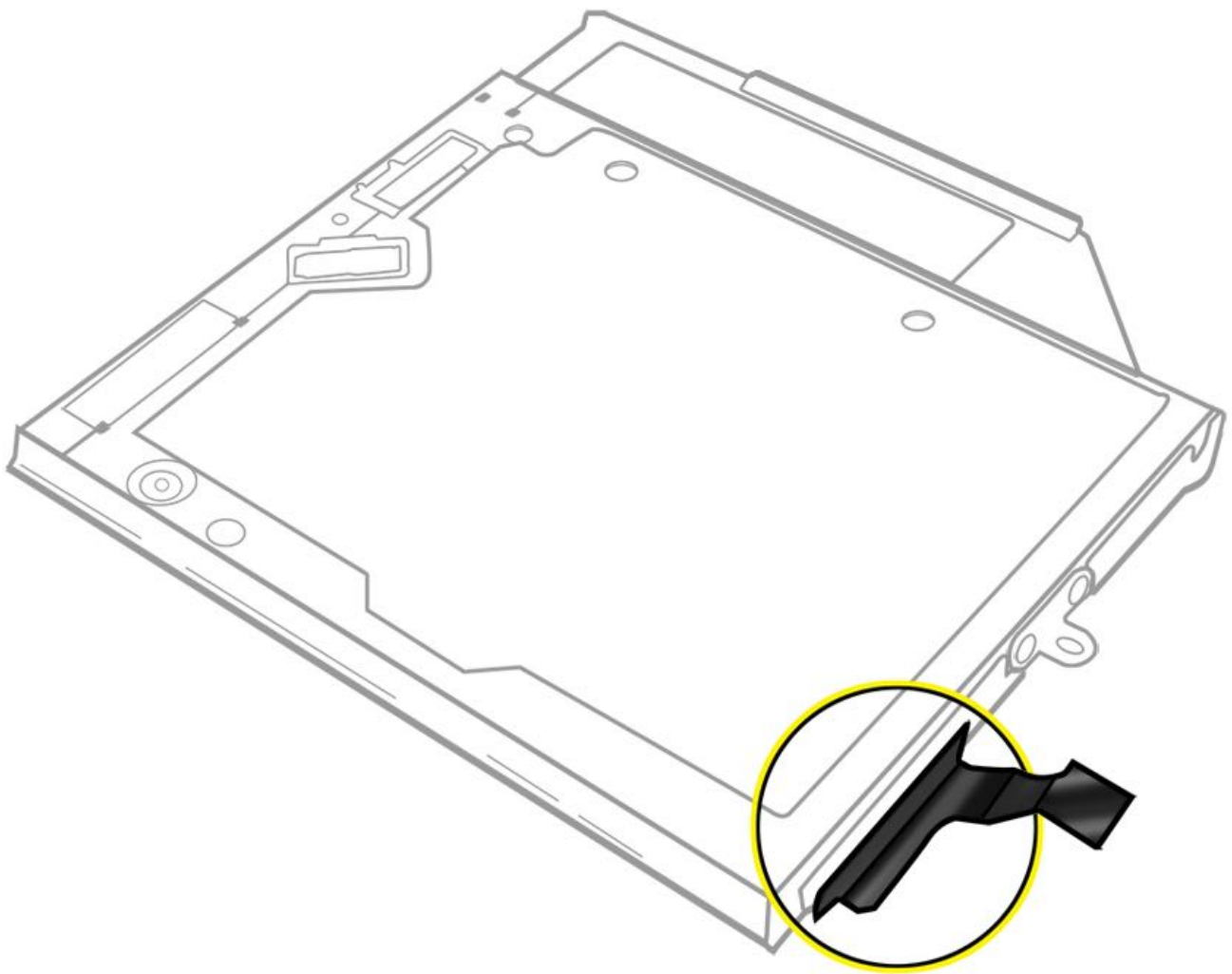


# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Optical Drive Flex Cable

## First Steps

Remove:

- [Bottom Case](#)
- [Battery](#)
- [AirPort/Bluetooth Flex Cable](#)
- Move [AirPort/Bluetooth Card](#) slightly to the right
- [Optical Drive](#)



## Tools

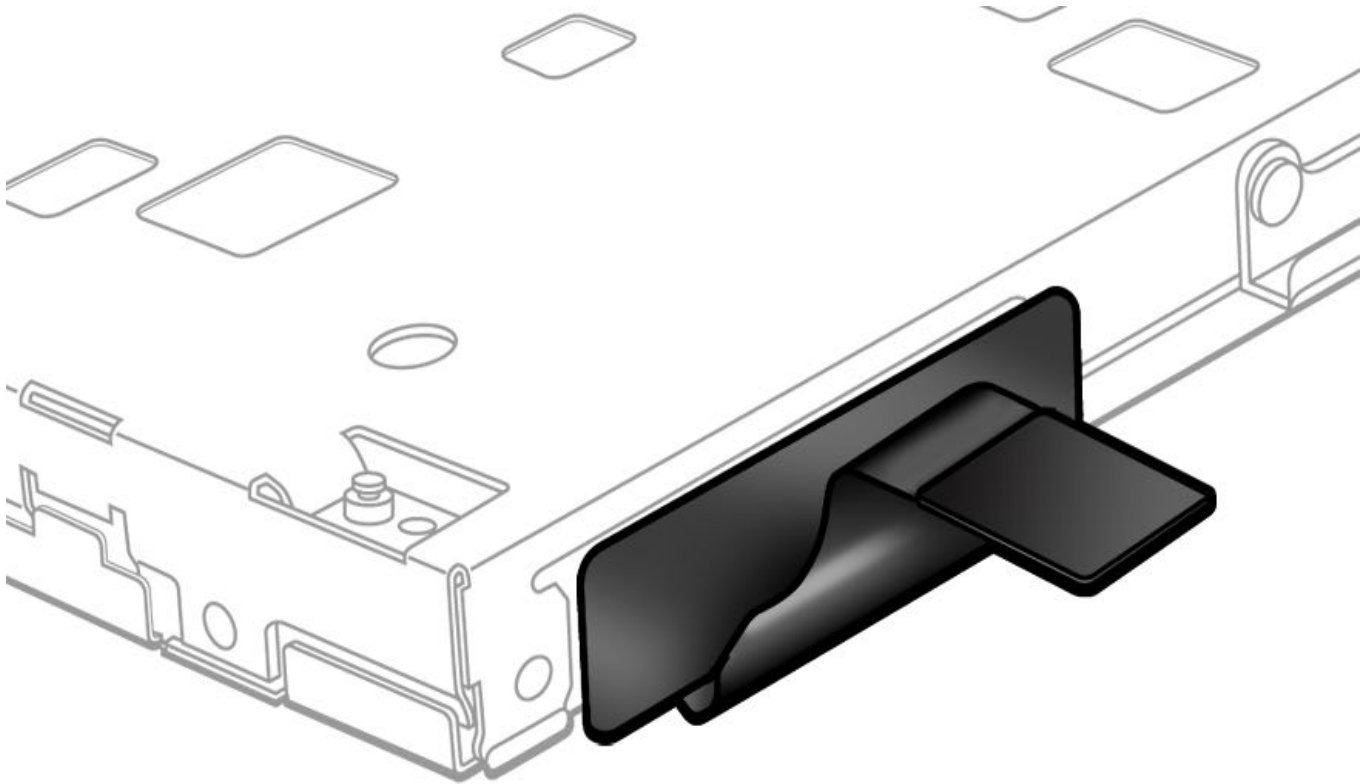
- ESD wrist strap
- Clean, soft, lint-free cloth
- Black stick





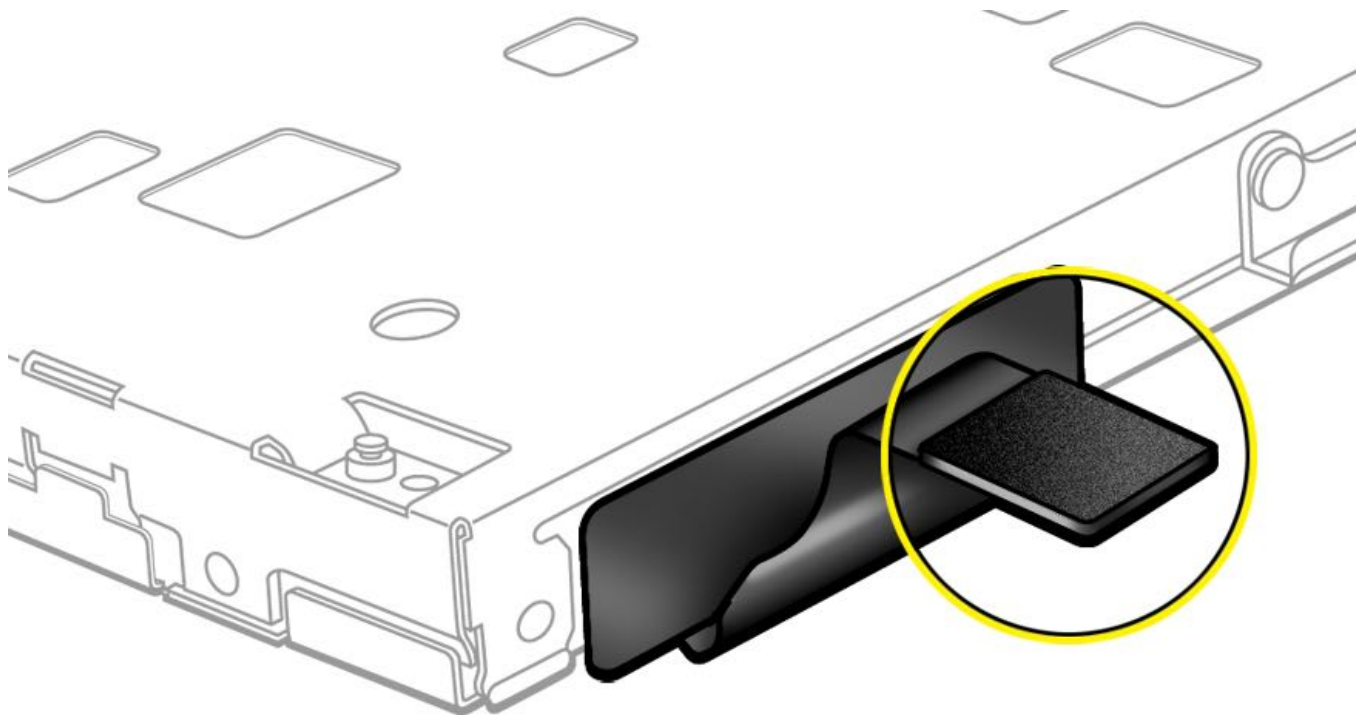
## Steps For Removal

1. Handle optical drive by sides only.
2. Evenly disconnect flex cable from drive.



## Steps For Reassembly

**Reassembly Note for Early 2011:** Apply the foam pad included with the replacement cable to the top of the cable connector, as illustrated.





# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Right Speaker / Subwoofer

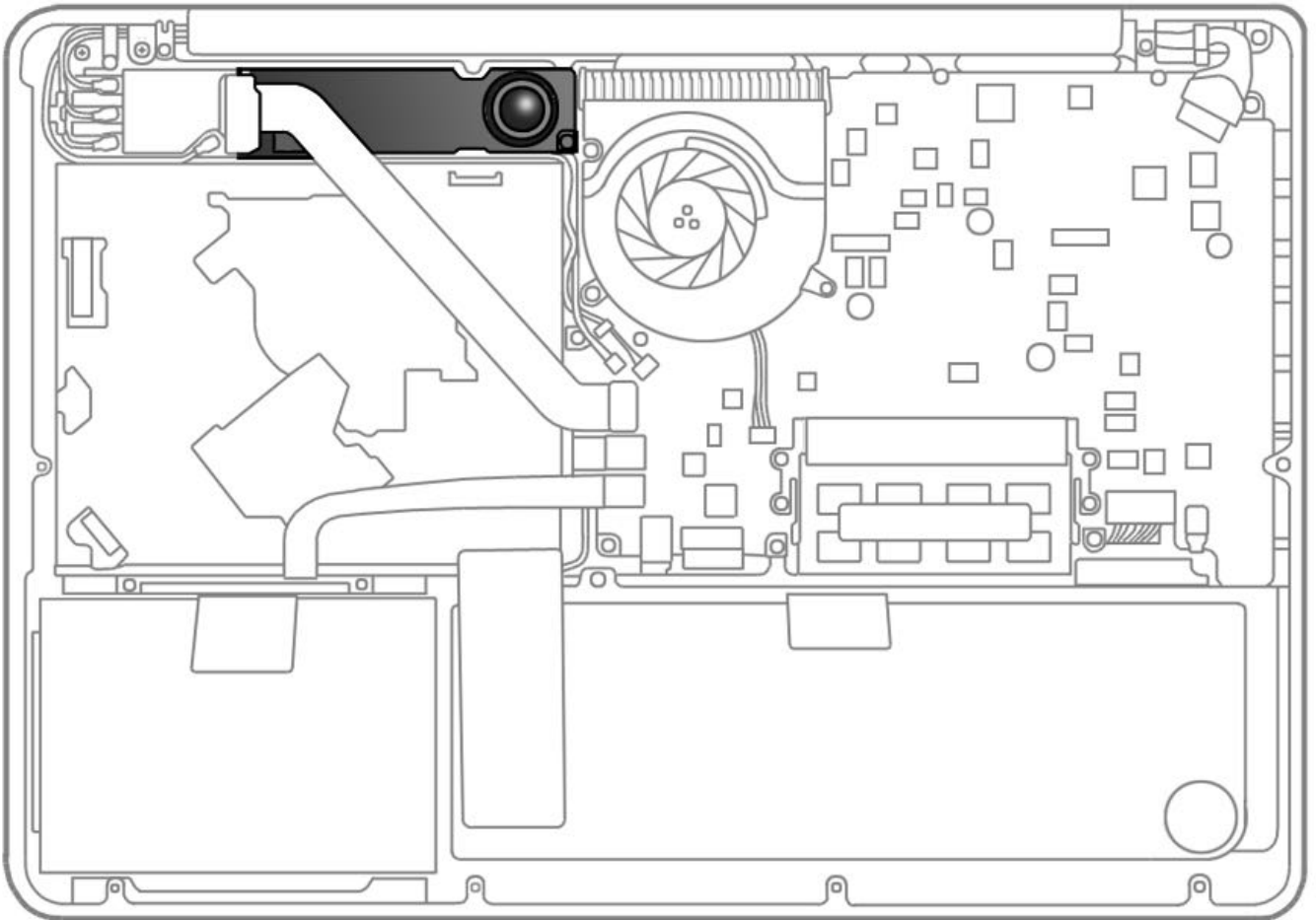
## First Steps

Remove:

- [Bottom Case](#)
- [Battery](#)
- [AirPort/Bluetooth Flex Cable](#)
- Move [AirPort/Bluetooth Card](#) slightly to the right
- [Hard Drive](#) Flex Cable screws
- [Optical Drive](#)



**Caution:** Do not touch soft speaker cones.



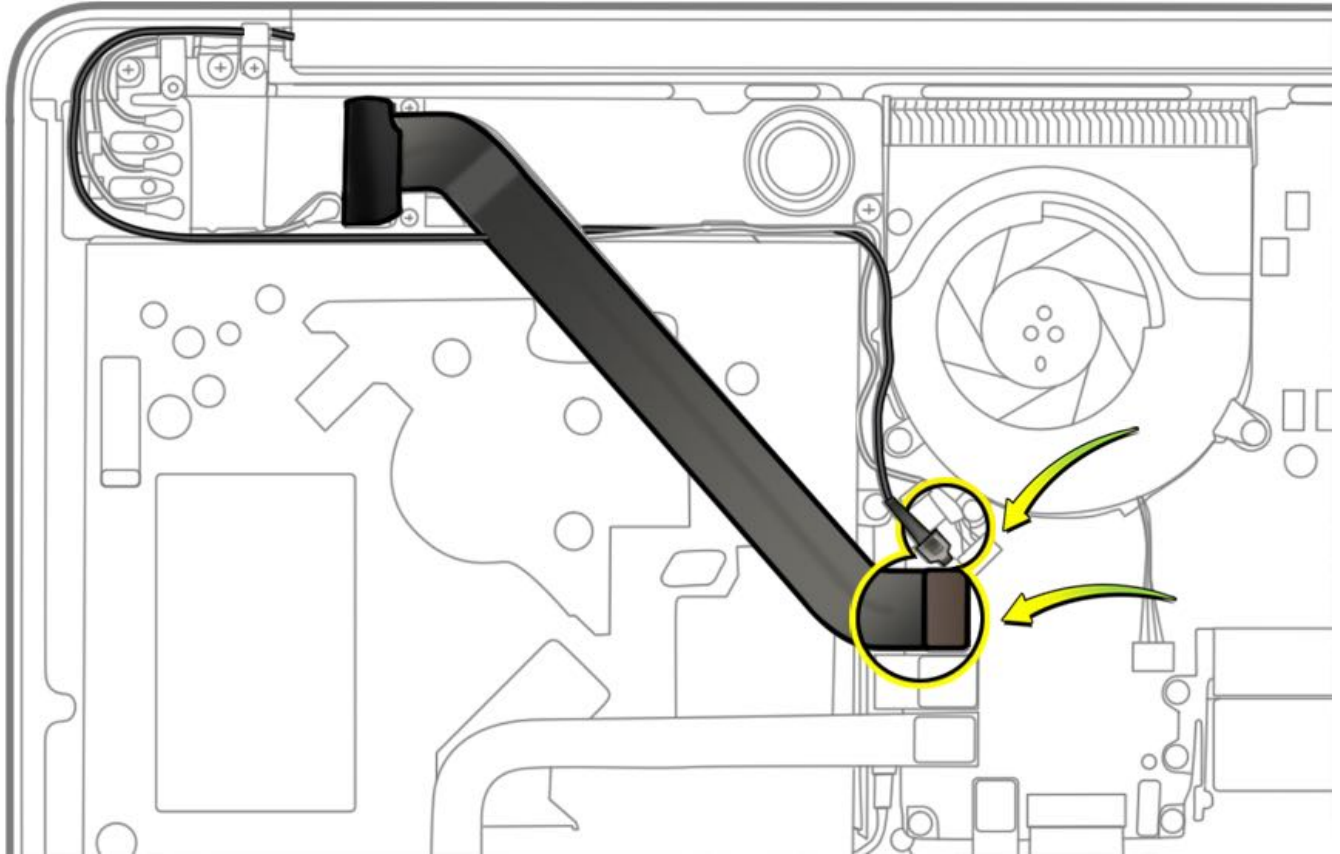
## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Kapton tape
- Black stick
- Phillips #00 screwdriver, magnetized



## Steps For Removal

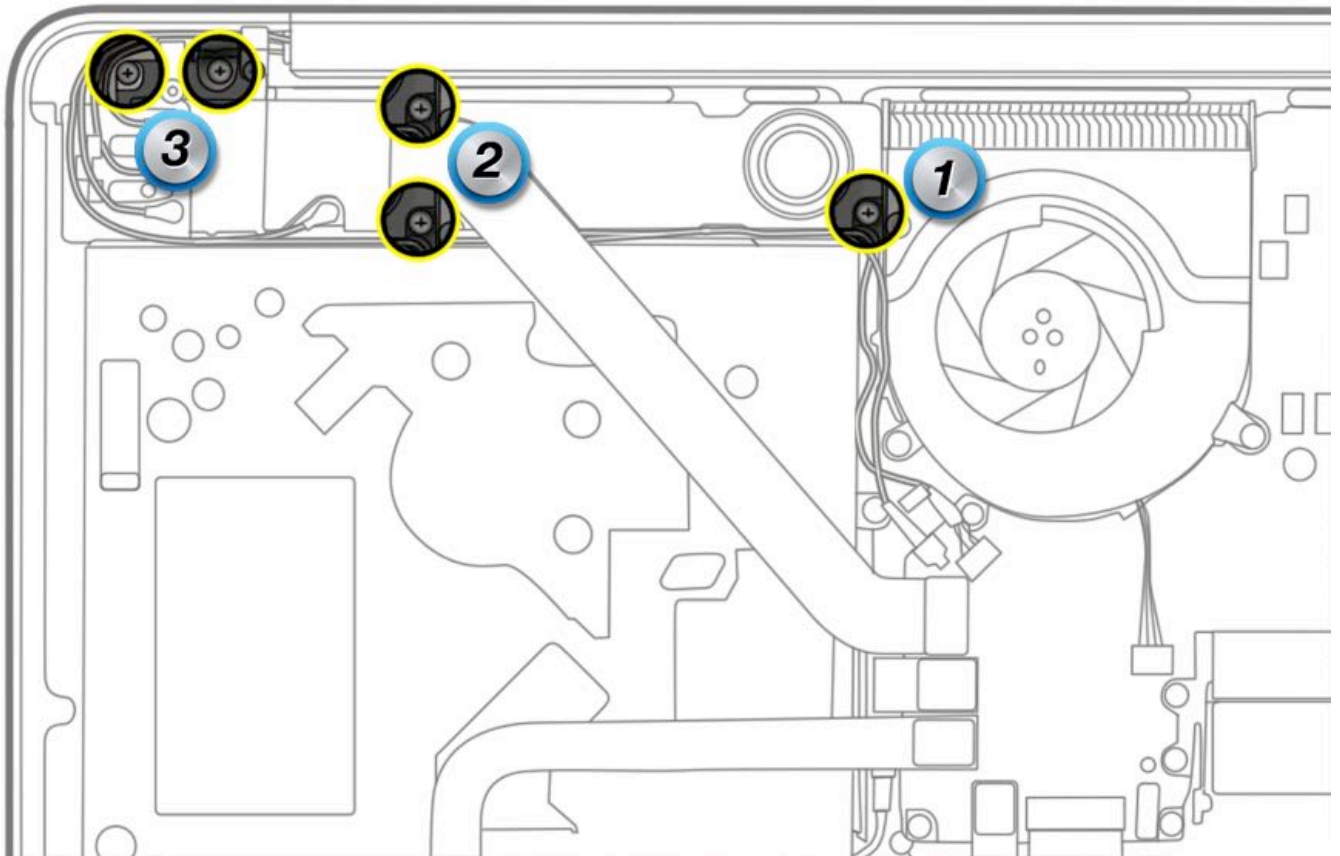
1. Disconnect cables from logic board.



2. Remove 5 screws on AirPort/Bluetooth card carrier to separate the AirPort/Bluetooth card from the speaker:

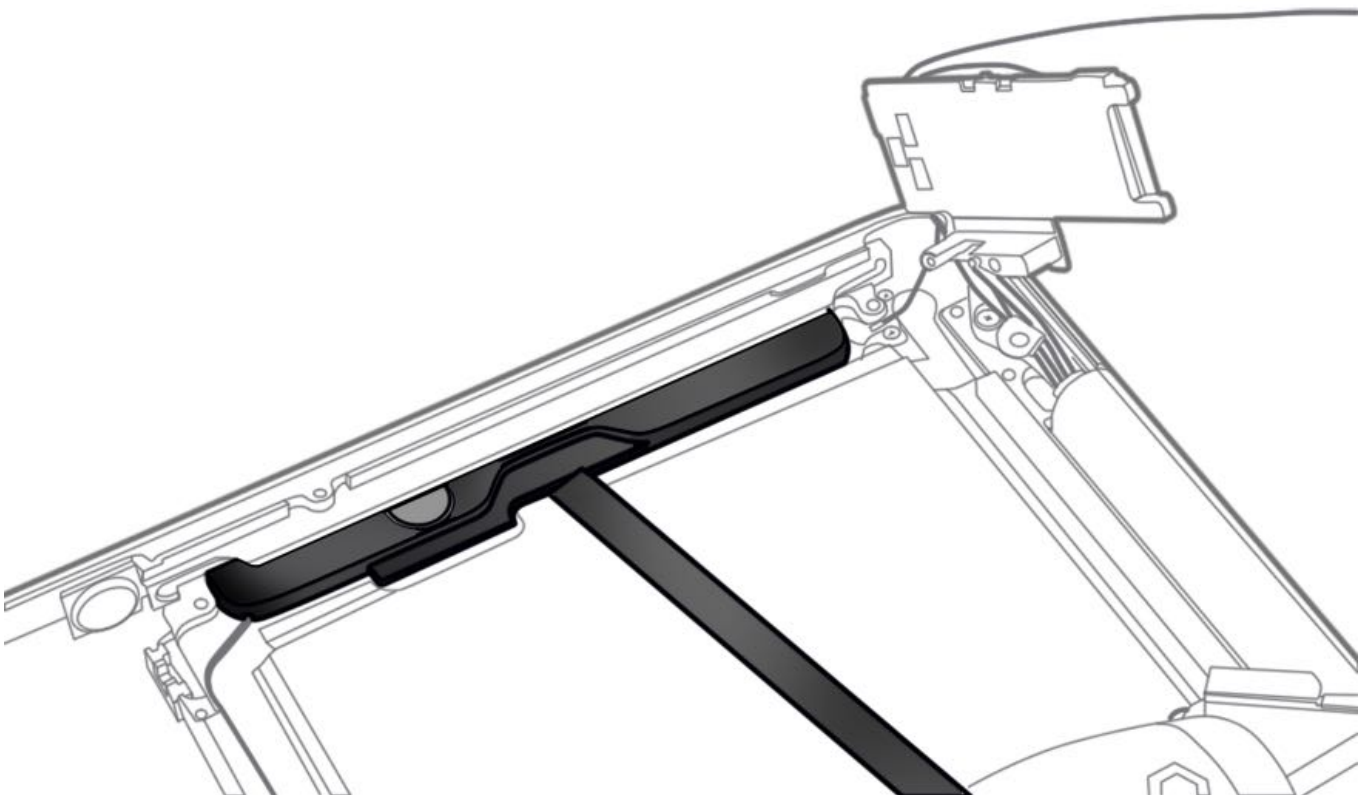
1. (922-8744, 4.5mm) - 1 screw
2. (922-9777, 2.5mm) - 2 screws
3. (922-9778, 2.5mm) - 2 screws

3. Remove AirPort/Bluetooth card carrier and optical drive.



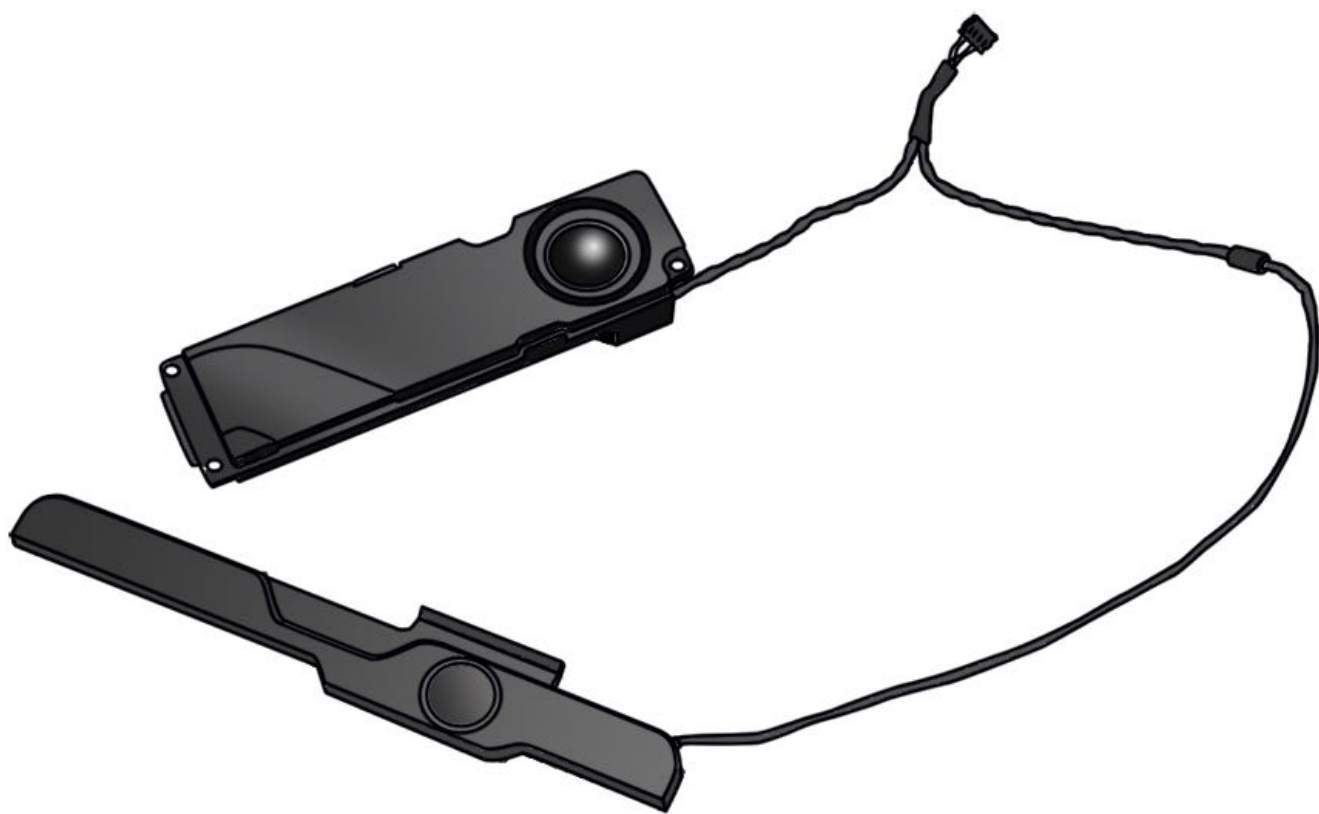
4. Pry up speaker body from top case to loosen adhesive.

**Reassembly Note:** Apply Kapton tape on flex cable if conductive wrap loses adhesivness.



### Steps For Reassembly

1. Peel adhesive backing off speaker body and install in top case.
2. Reassamble and follow cable routing
3. **Note:** Antenna grounding tine must be secured with screw for reassembly



# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Trackpad

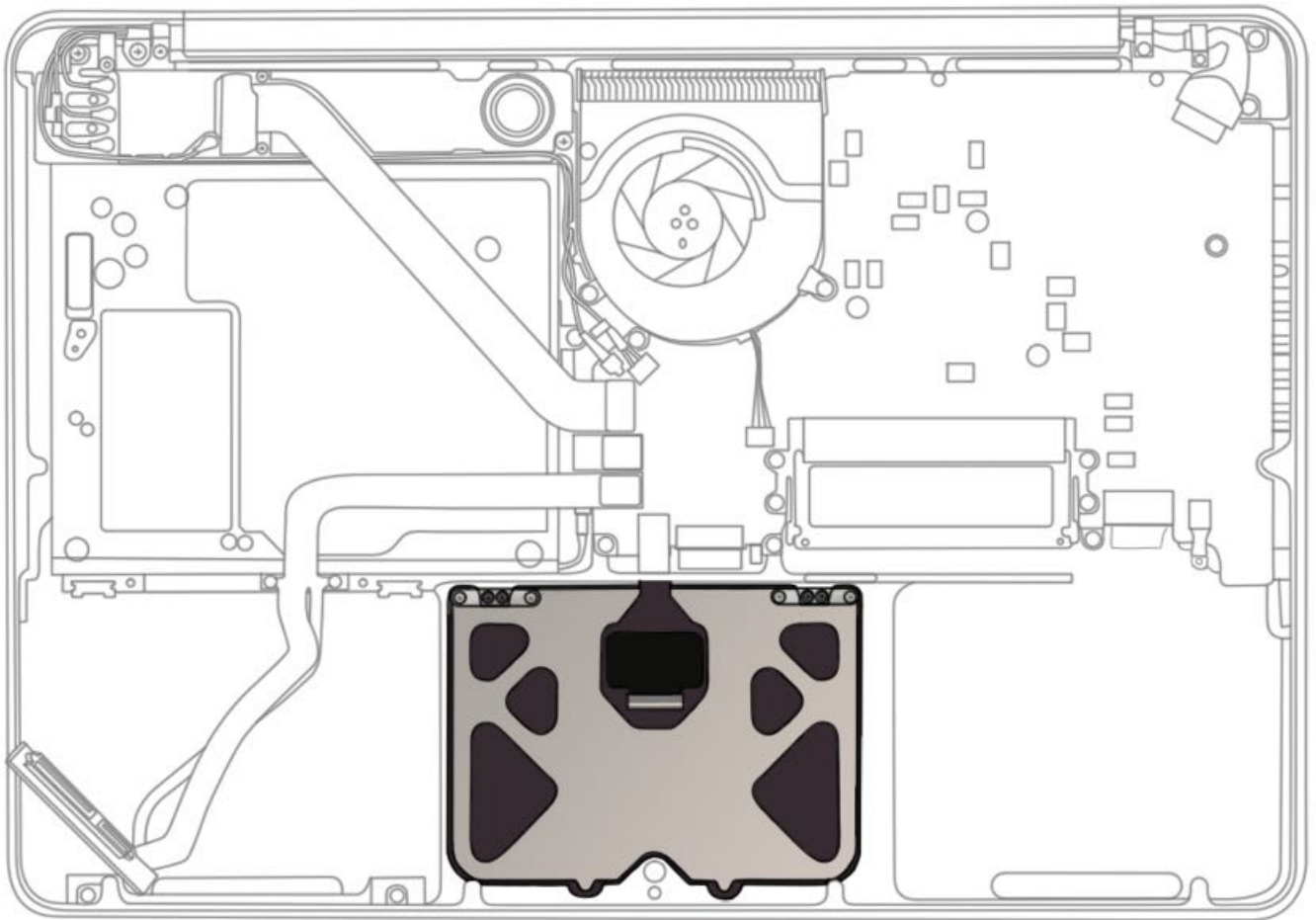
## First Steps

Remove:

- [Bottom Case](#)
- [Battery](#)

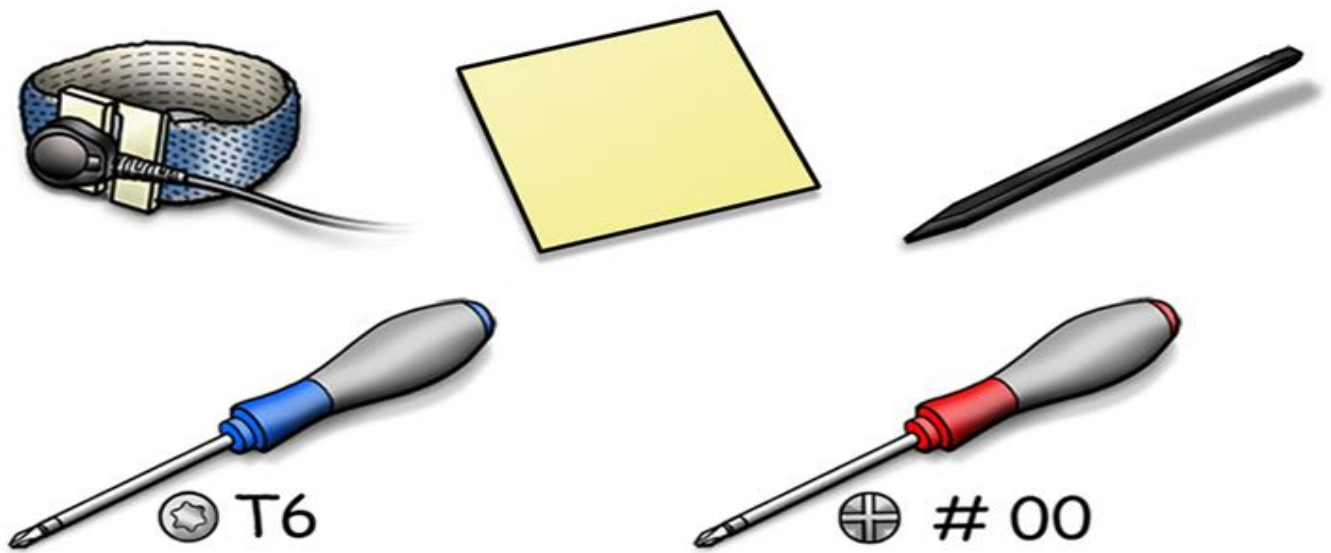
**Note:** A replacement trackpad includes:

- (2) metal flexures
- (4) black Phillips #00 screws
- (4) silver Phillips #00 screws
- (1) T6 set screw



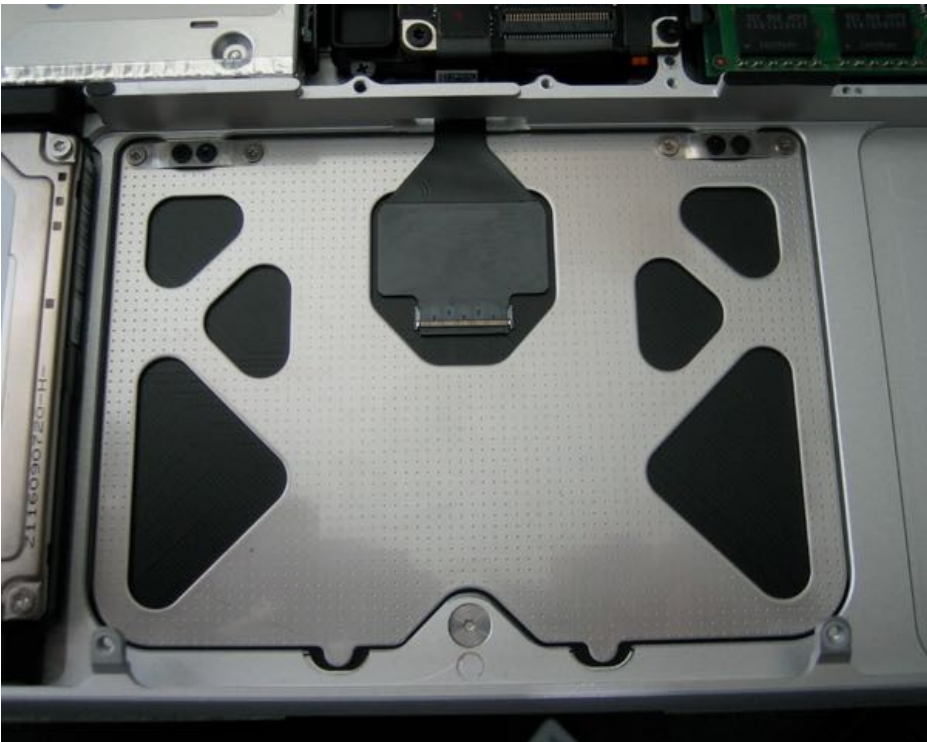
## Tools

- ESD wrist strap
- Sticky (Post-it) notes
- Black stick
- Phillips #00 screwdriver, magnetized
- Torx T6 screwdriver, magnetized



### Steps For Removal

1. Disconnect trackpad flex cable from logic board.
2. Remove 8 Phillips #00 screws from flexures (4 black inner screws to top case; 4 silver outer screws to trackpad)

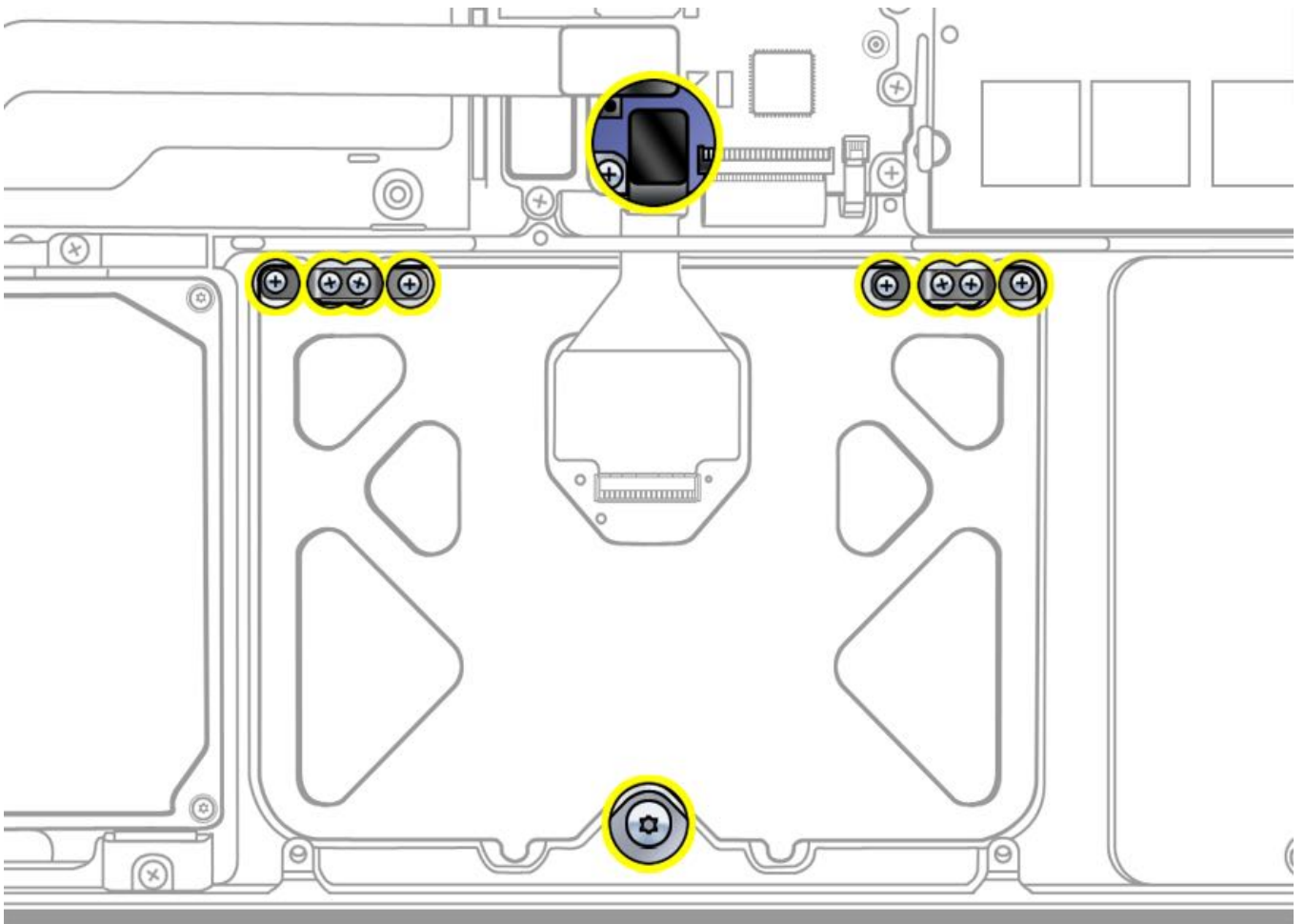


3. Remove 1 large T6 set screw.



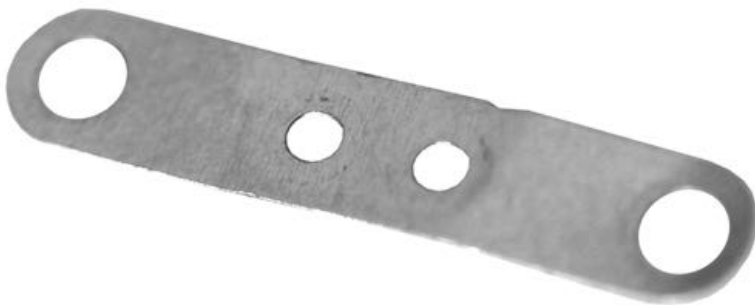
4. Dispose of old screws; they do not hold securely if reused.

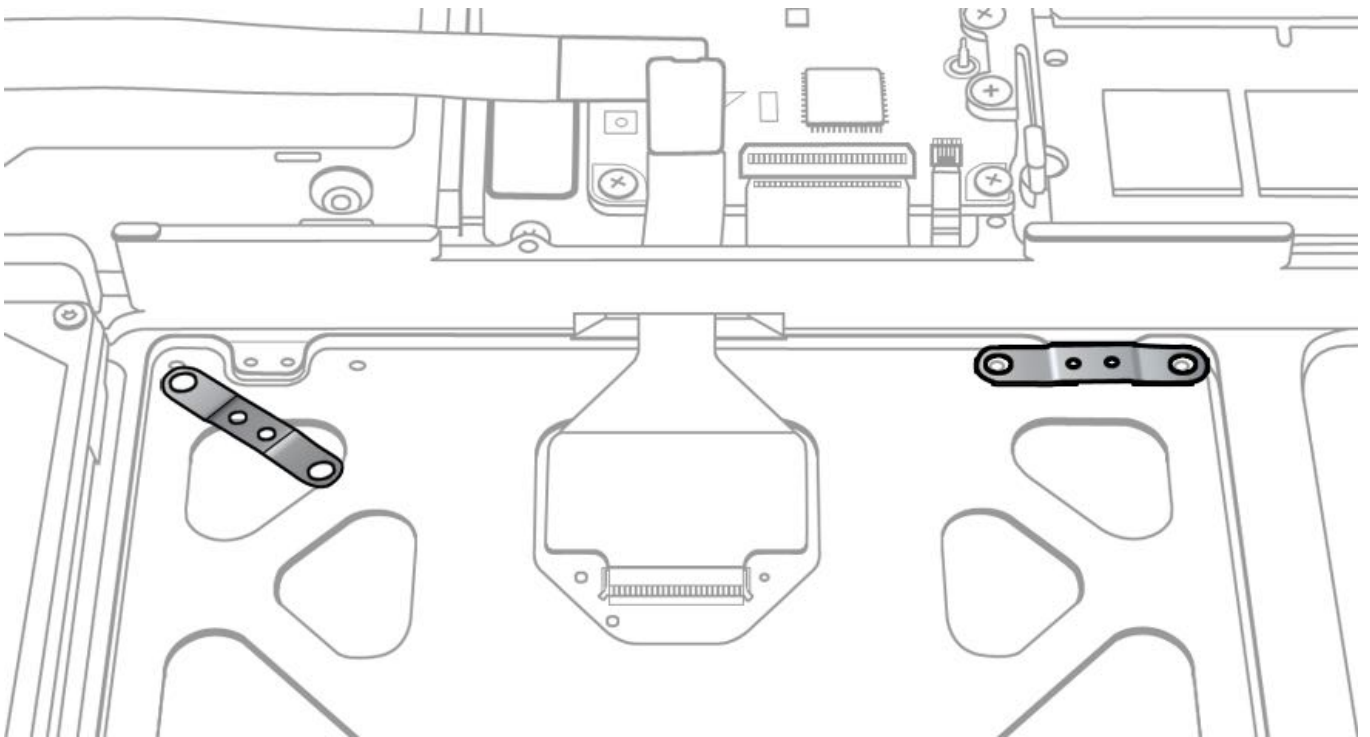




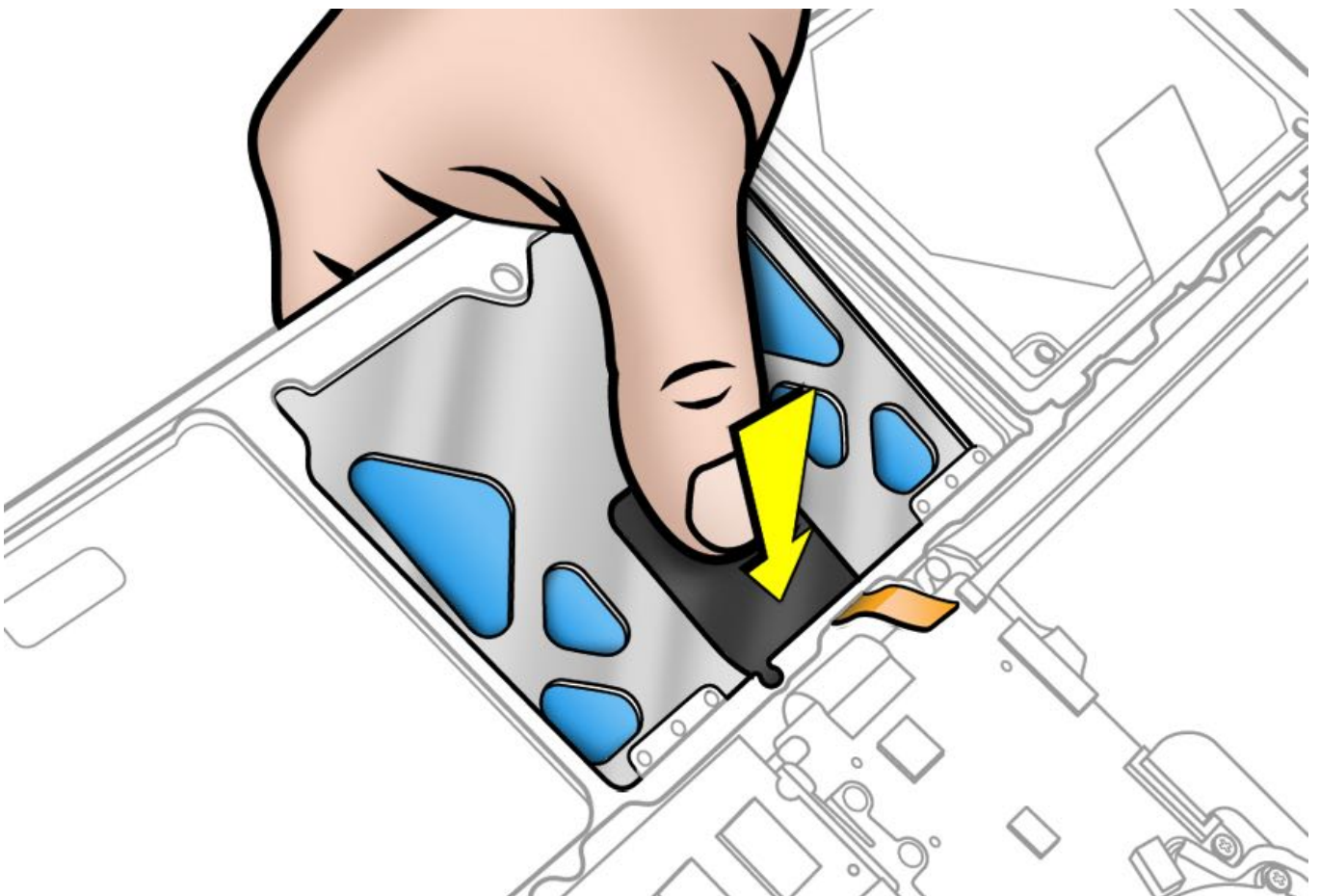
5. Remove 2 flexures (thin metal pieces) from top case.

6. Dispose of old flexures; they are matched to each individual trackpad by thickness.



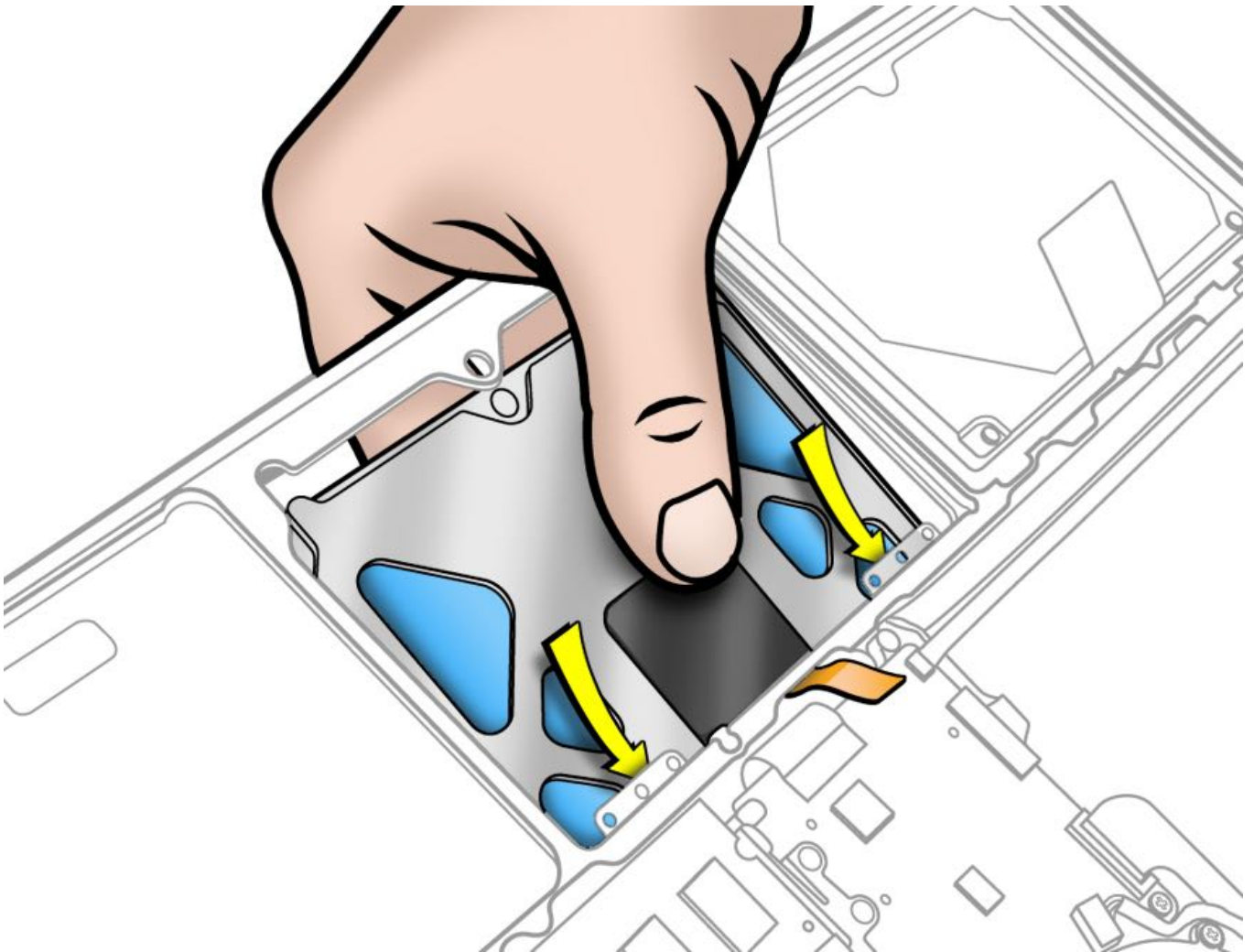


7. Hold trackpad and press down on edge closest to logic board.

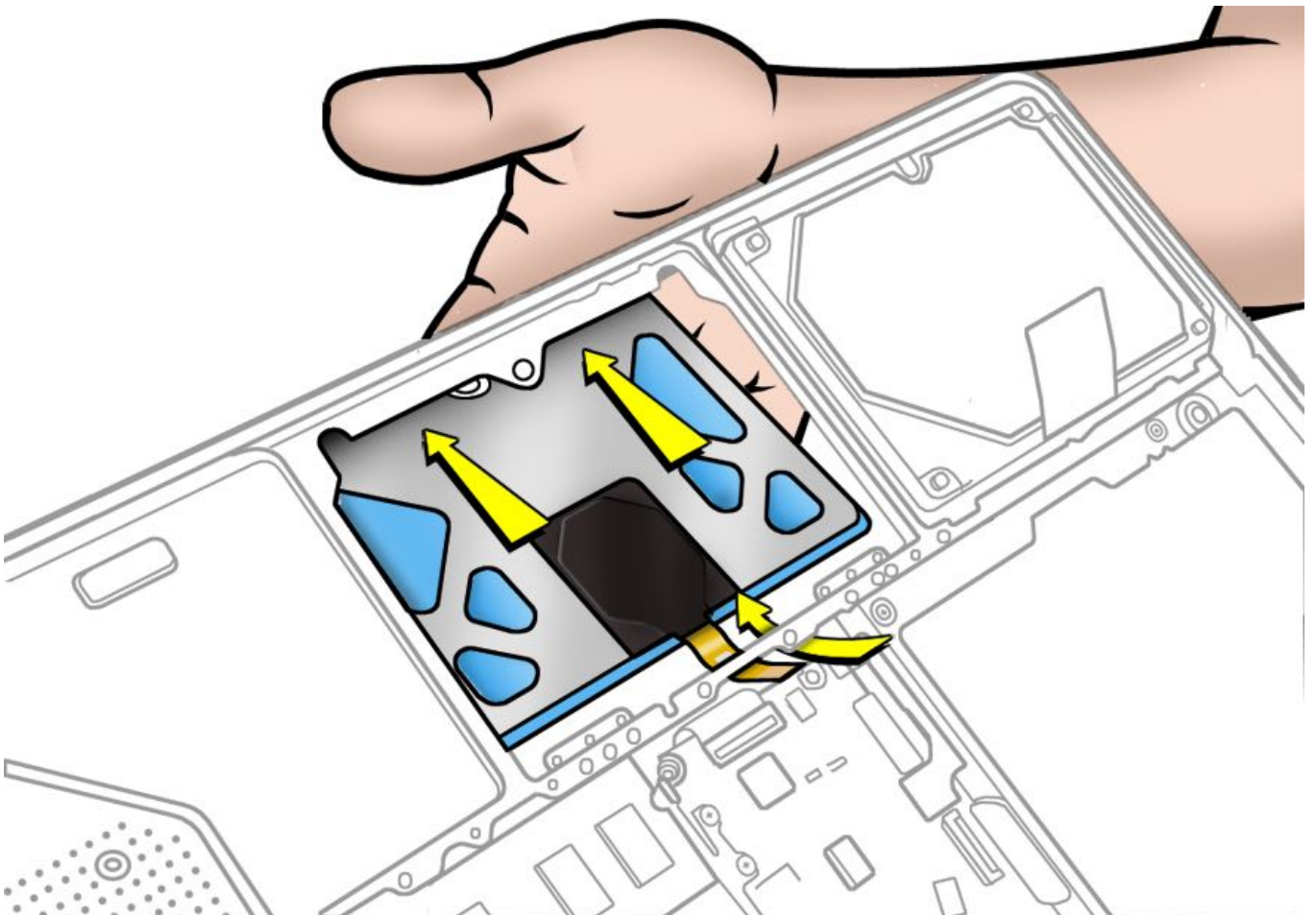


8. Slide trackpad down and back towards keyboard to clear supports in front edge of top case.

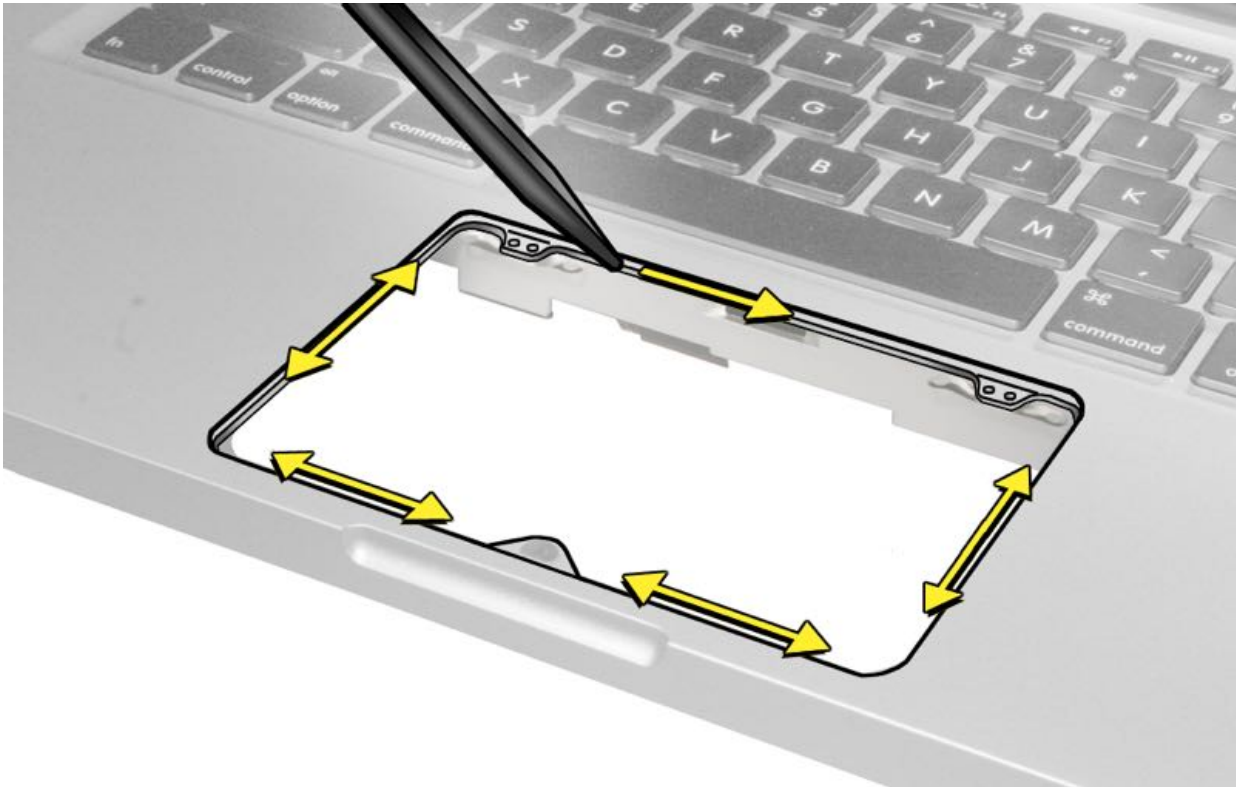




9. Remove trackpad from top case, taking care to route flex cable through hole.



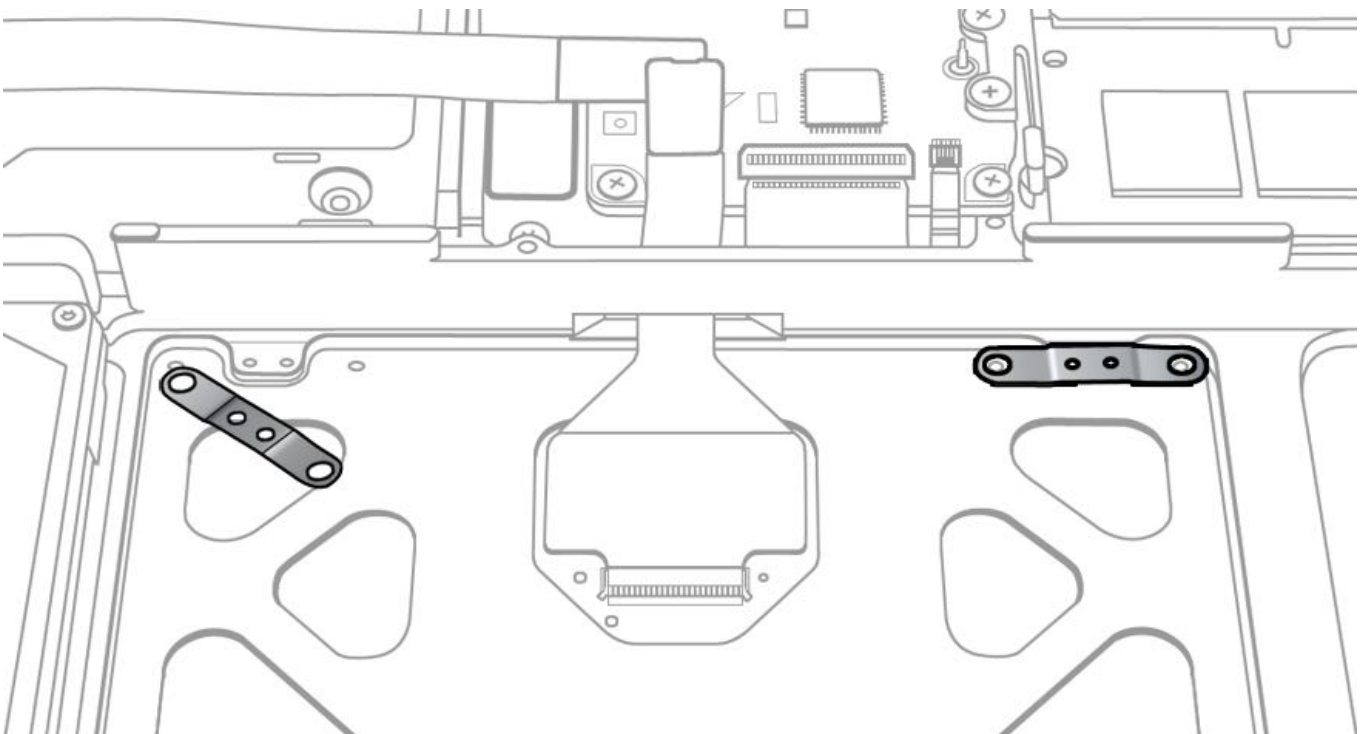
10. Clean the top case around the edge of the trackpad to eliminate accumulated debris. Debris may restrict trackpad movement and hinder clicking motion.



## Steps For Reassembly

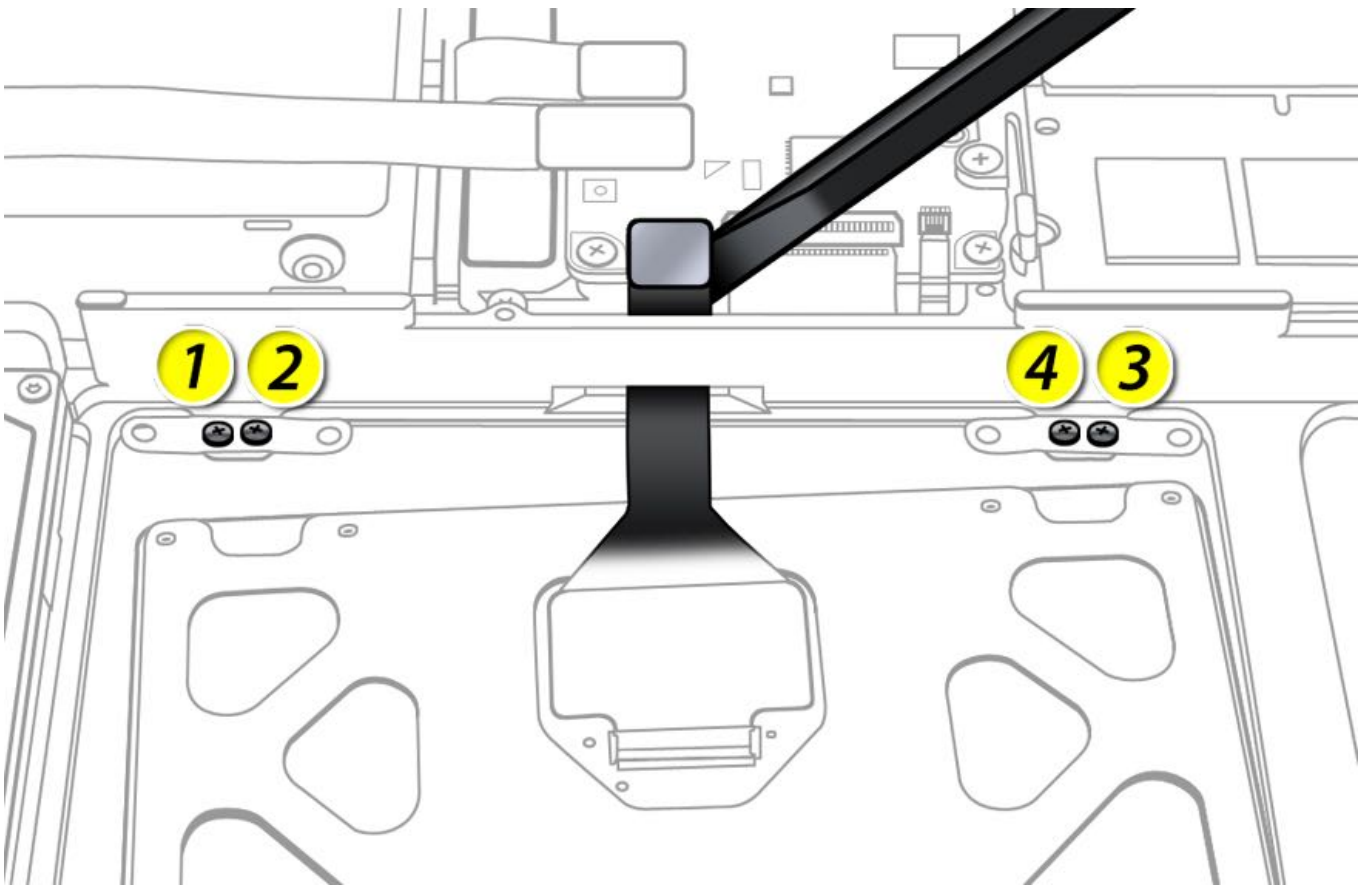
**Important:** Dispose of old flexures and screws, and only use new ones included with trackpad kit.

1. Use black stick to carefully route flex cable through guide hole.
2. Align flexures onto top case.

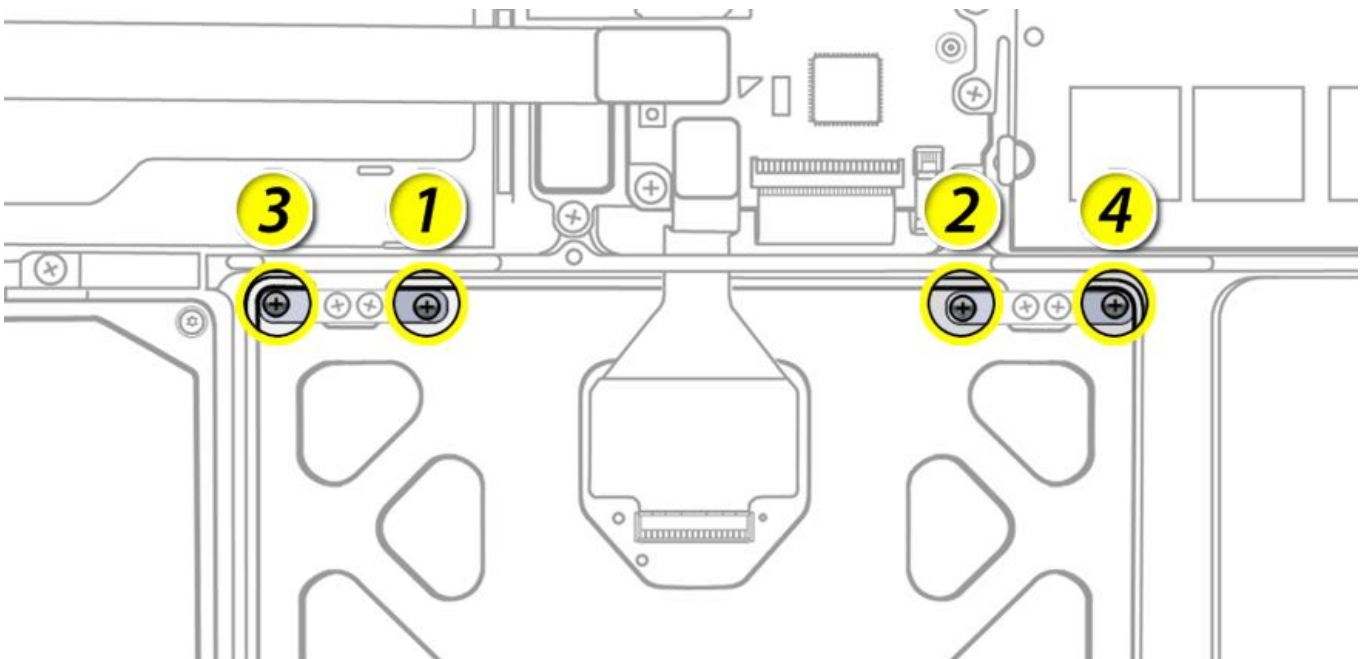


3. Install (2) black screws (1.2mm) in the center of each flexure in the order shown.
4. Pivot trackpad into place, inserting front edge first.

**Important:** Minimize rubbing edges of trackpad against top case while installing. This could cause tiny cracks to form on the trackpad.



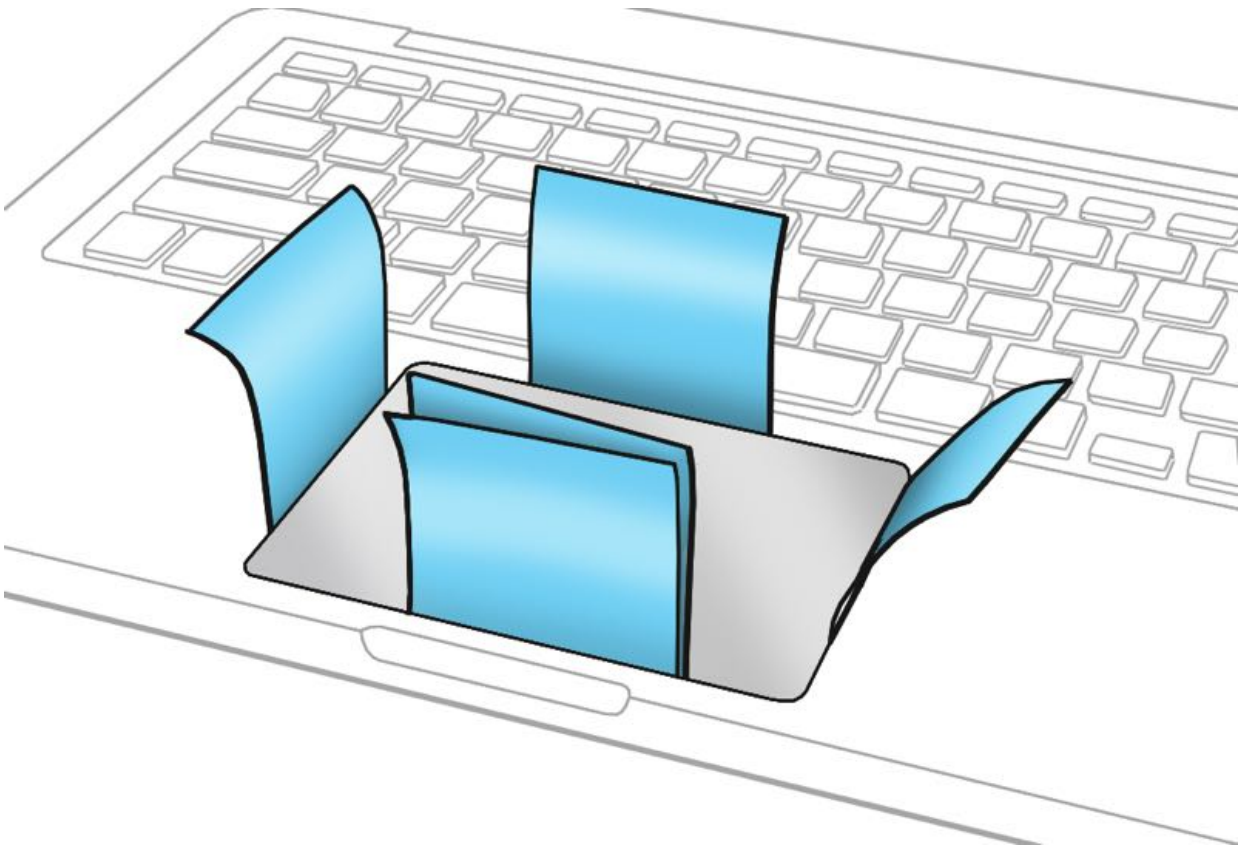
5. Loosely insert (4) silver screws (0.9mm) into outer holes of flexures in order shown. Do not tighten yet.



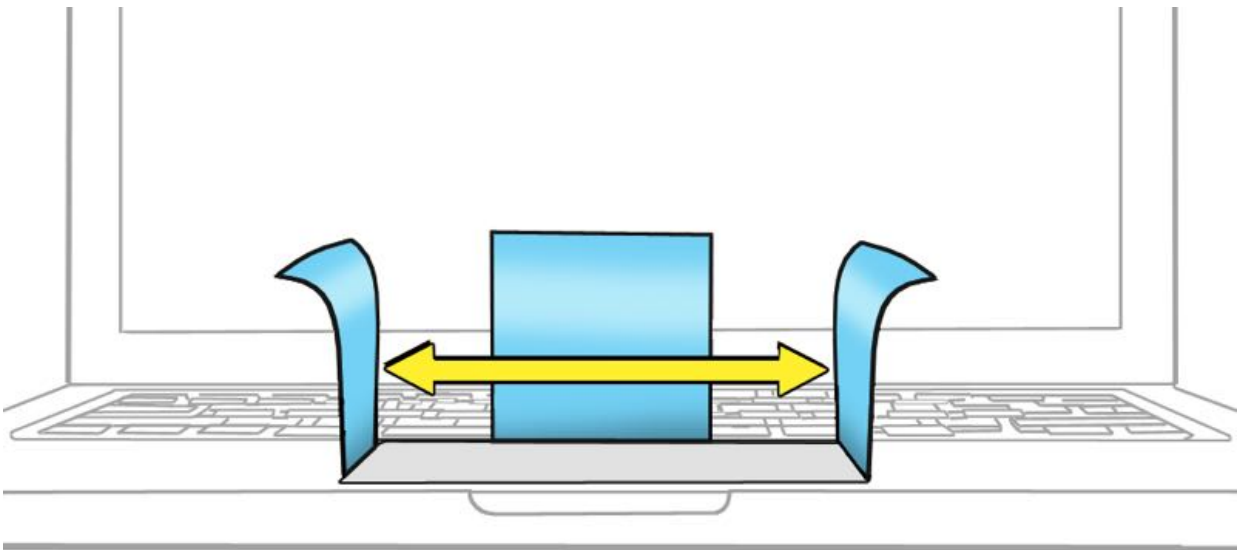
6. On the palm rest, insert one sticky note into gap on each of the four sides of trackpad. If you cannot use a full size you can tear full size in half to use for alignment.

Place two (2) stickies in the front most position. Stickies need only be inserted 1mm.

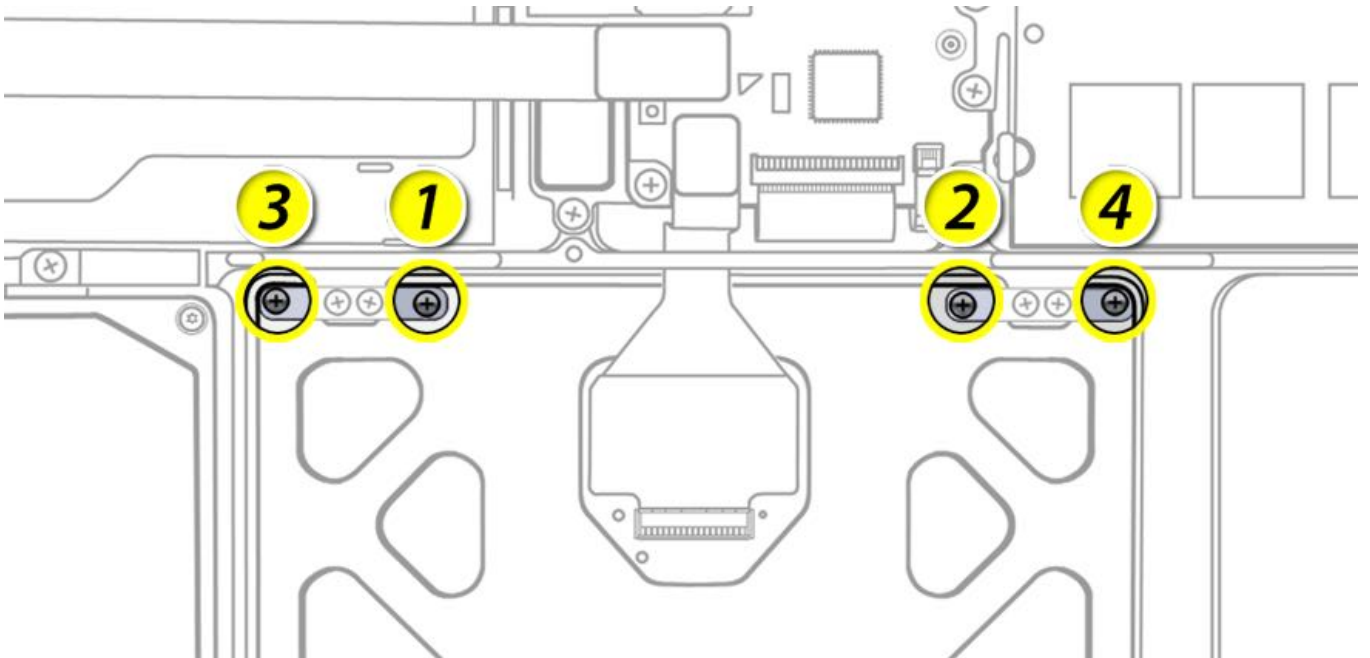




Slide each sticky back and forth along the trackpad seam to ensure even trackpad spacing. (The front 2 stickies have been removed in this drawing).



7. Tighten 4 silver outer screws at flexures.
8. Inspect that gaps between trackpad and top case are even on all sides. If not, loosen screws and adjust.



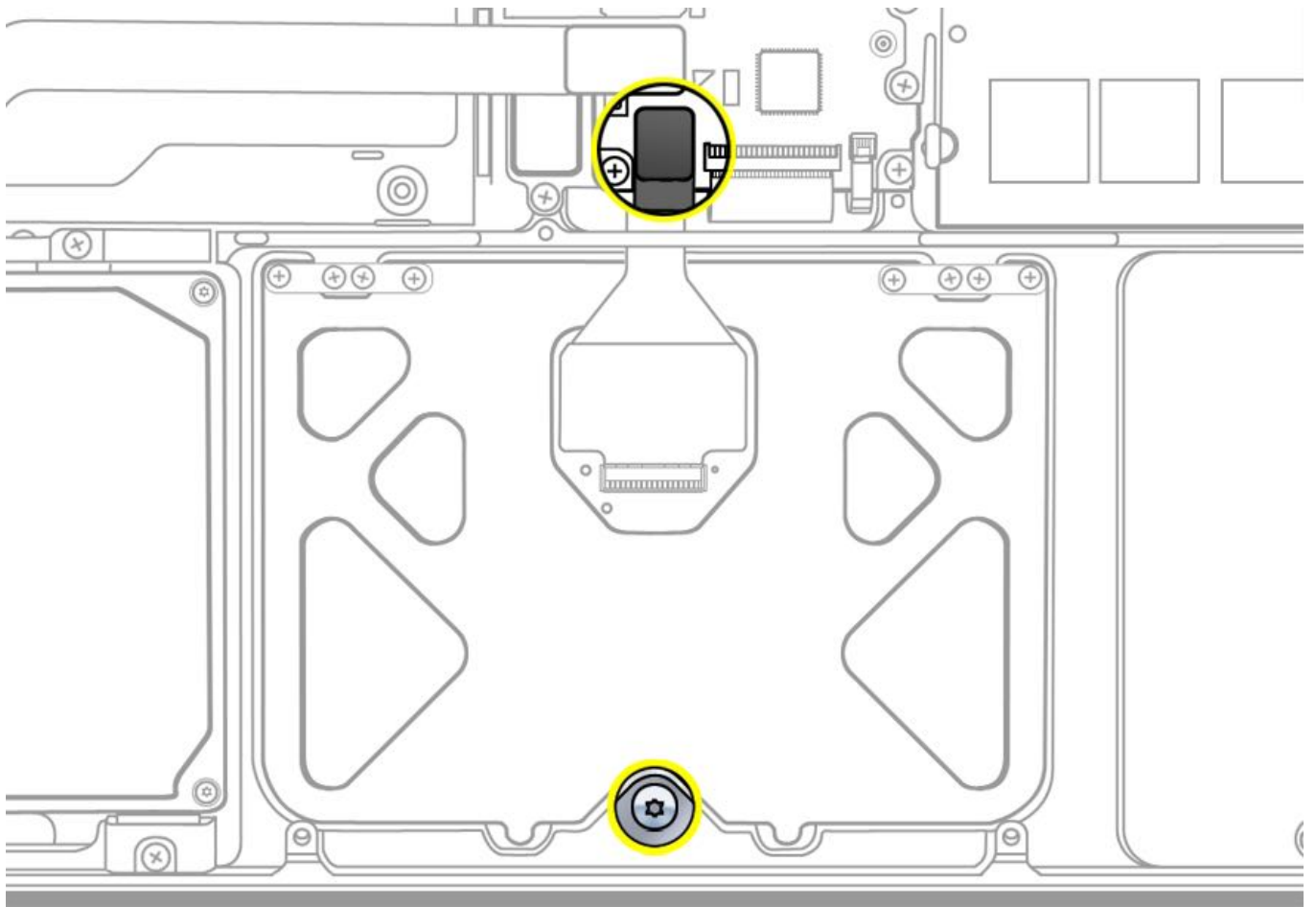
9. Connect flex cable to logic board.

10. Insert large T6 set screw.

11. Slowly turn set screw in small increments until trackpad has a normal clicking motion.

**Important:** Do not overtighten set screw or you may damage trackpad.



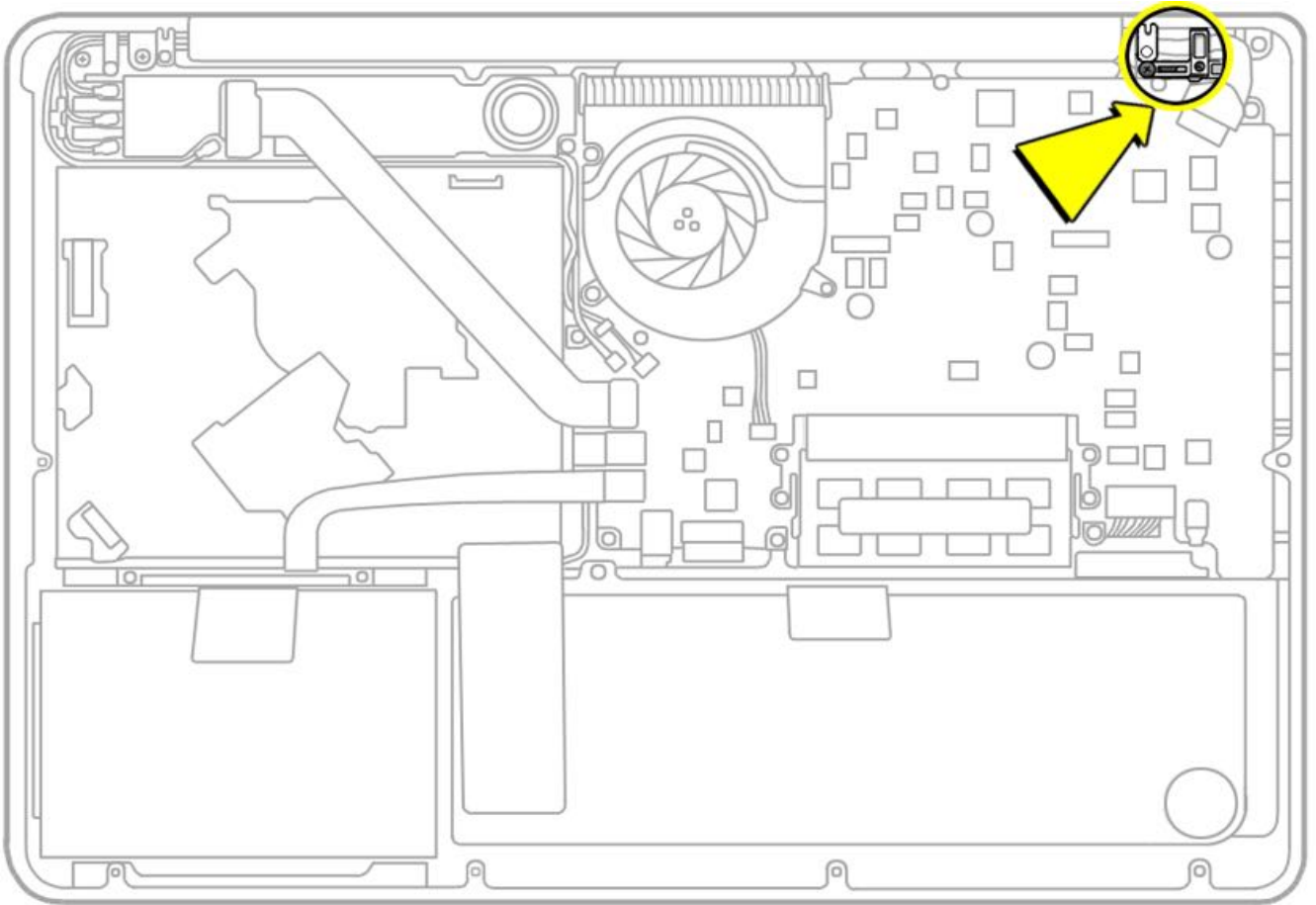


# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): LVDS Cable Guide

## First Steps

Remove:

- [Bottom Case](#)



## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Phillips #00 screwdriver, magnetized



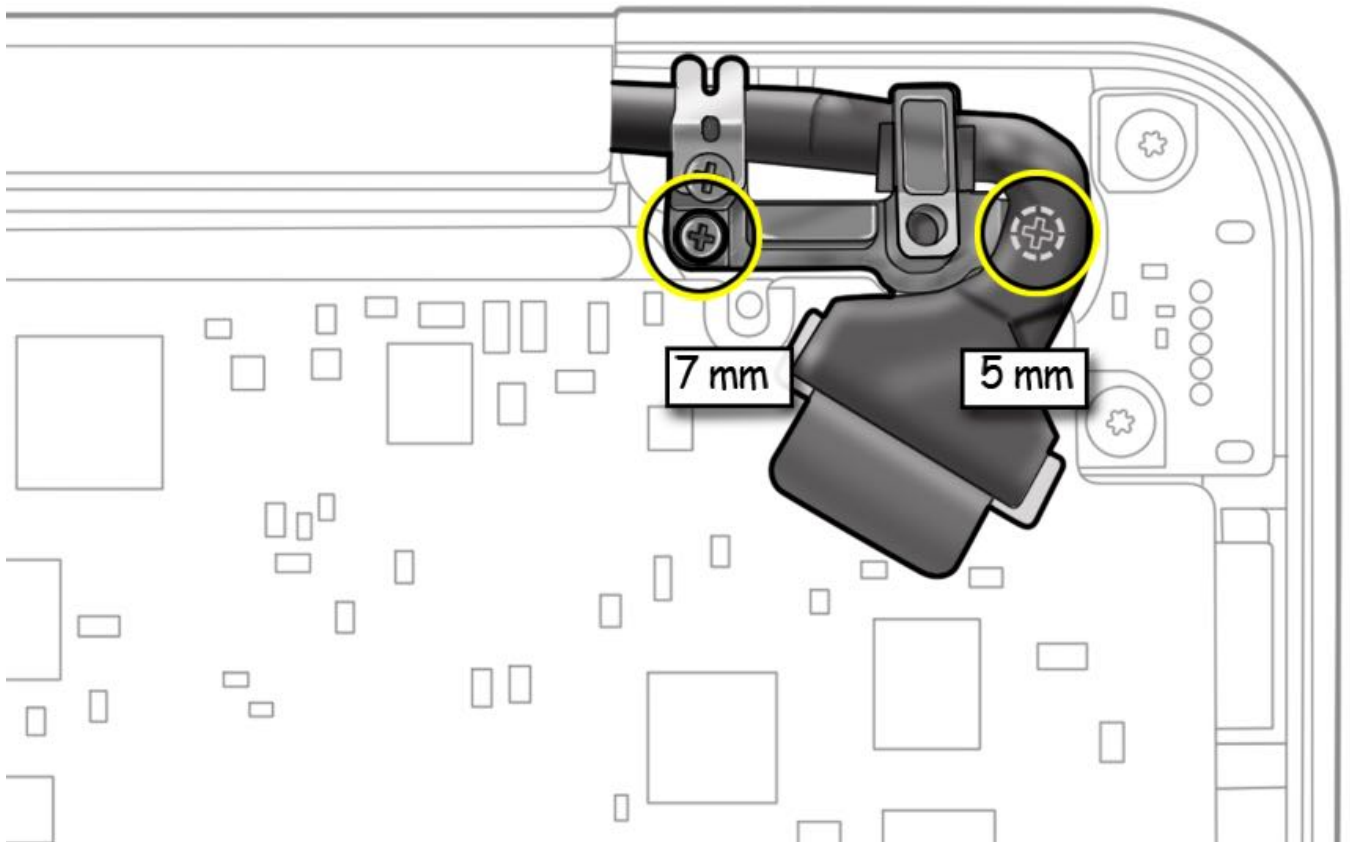
## Steps For Removal

1. Disconnect LVDS Cable and remove Phillips #00 screws:

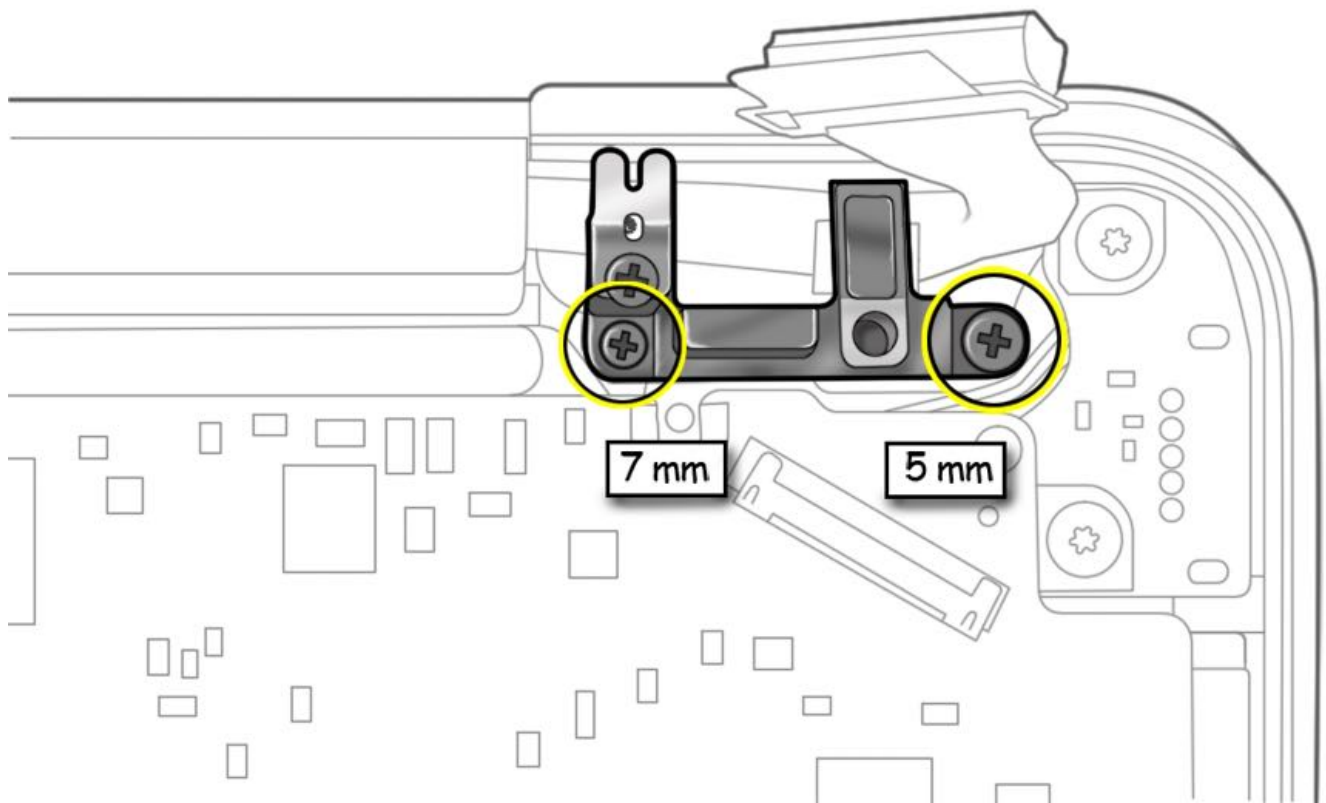
(1) 922-8658 (7mm)



(1) 922-9458 (5mm)



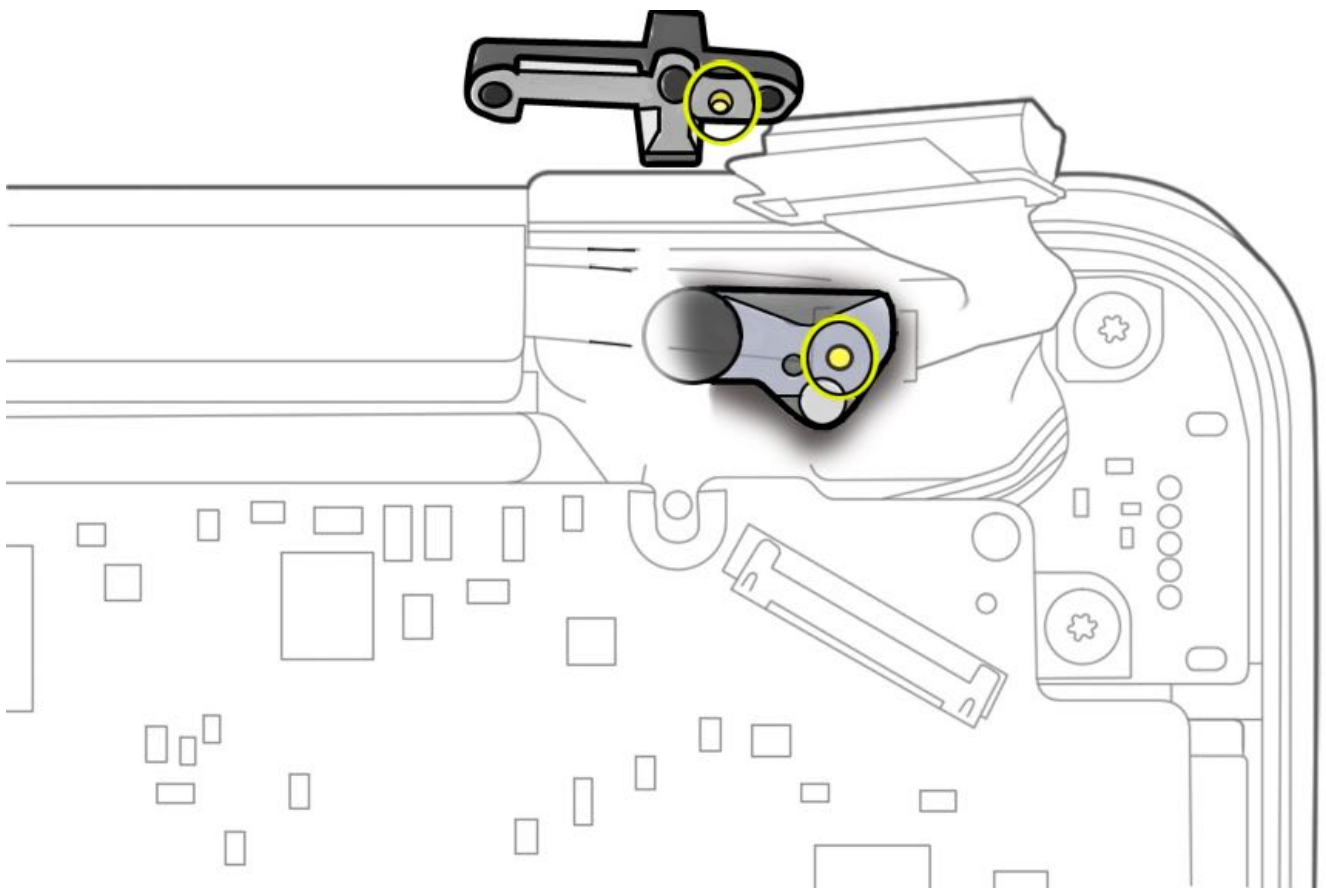




2. Lift out LVDS cable guide.

**Reassembly Note:** Align locator pin to hole in top case. There is no need to re-install the LVDS Gasket. Hinge movement may cause the gasket to 'travel' out of alignment. Remove LVDS gasket and do not re-install.

**Note: DO NOT** re-install the LVDS Gasket when re-assembling the LVDS cable guide. Repeated clutch action may cause the gasket to move out of place.



## Steps For Reassembly



# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Display Clamshell

## First Steps

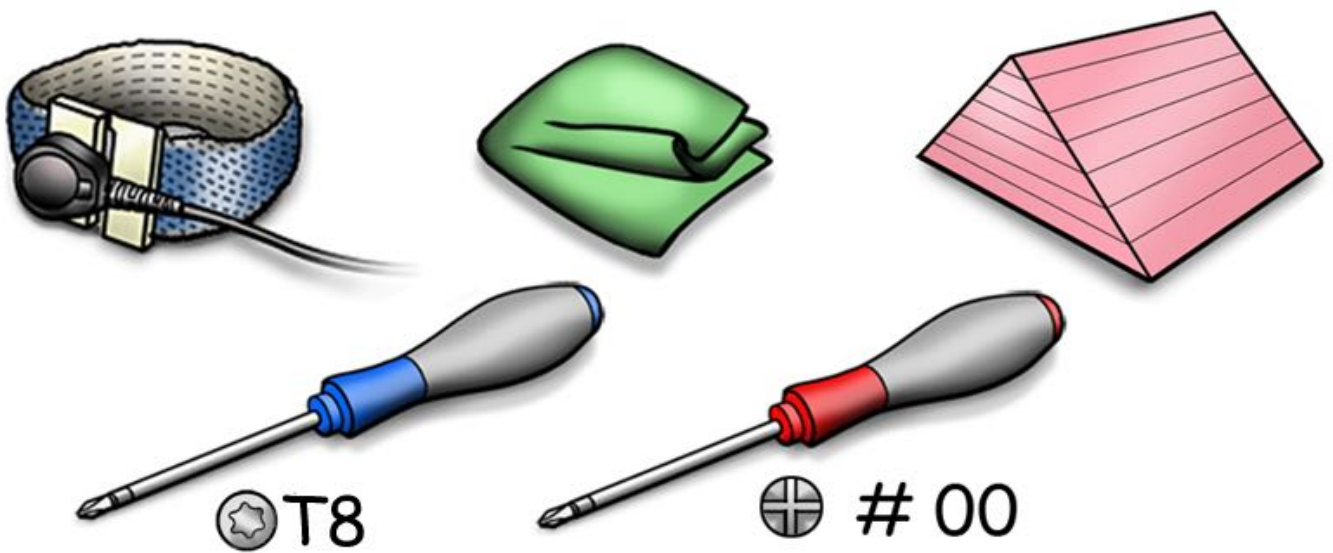
Remove:

- [Bottom Case](#)
- [AirPort/Bluetooth Flex Cable](#)
- [Right Speaker](#)
- [LVDS Cable Guide](#)



## Tools

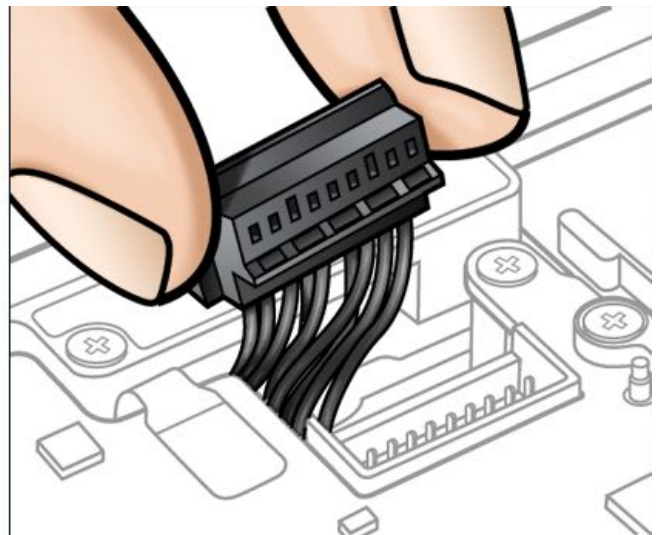
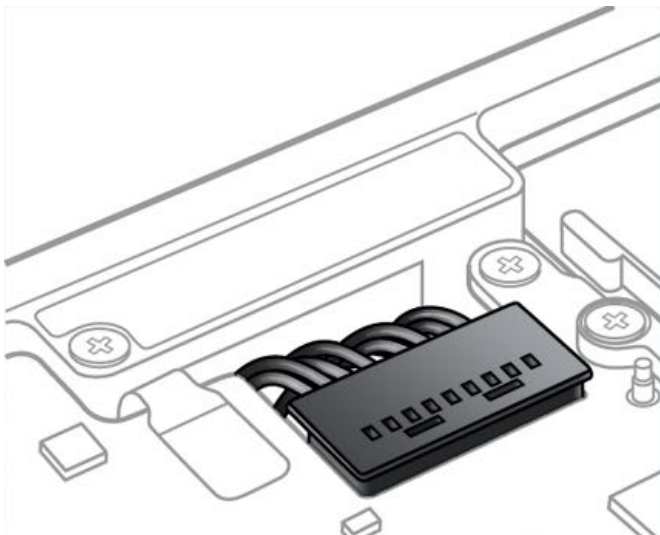
- ESD wrist strap
- Clean, soft, lint-free cloth
- Foam wedge fixture
- Phillips #00 screwdriver, magnetized
- Torx T8 screwdriver, magnetized



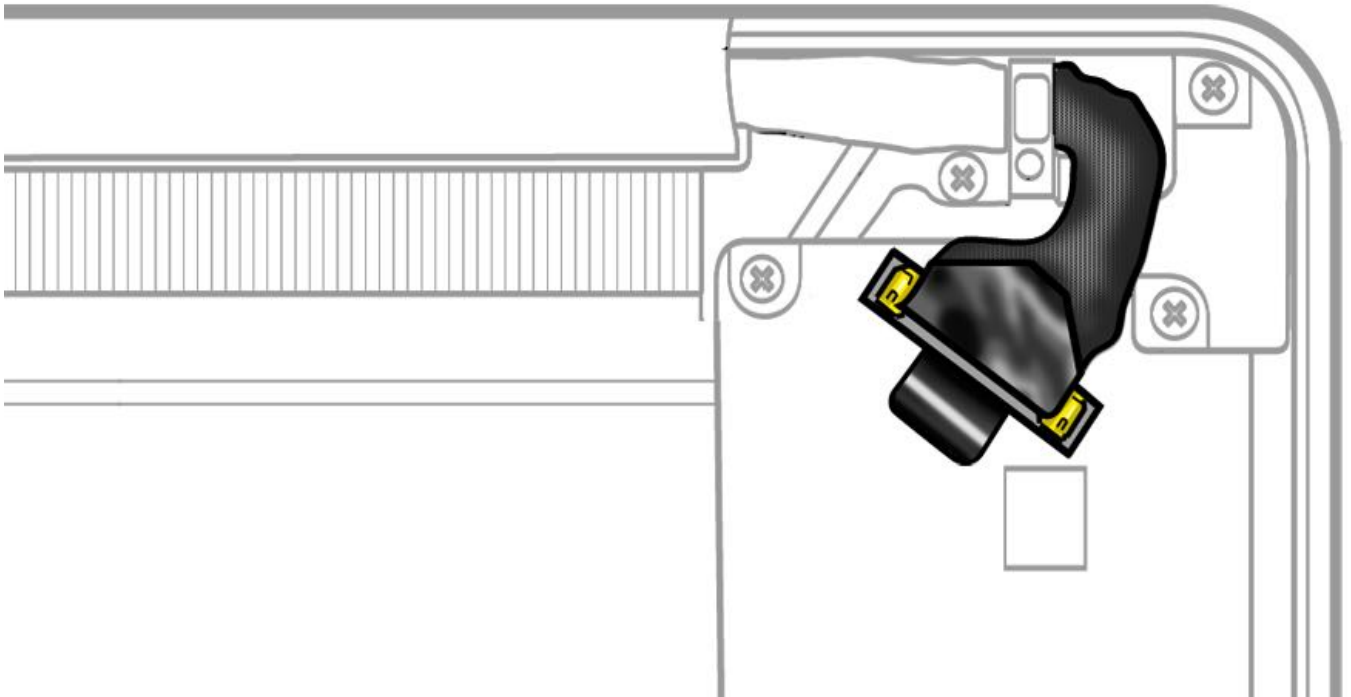
### Steps For Removal



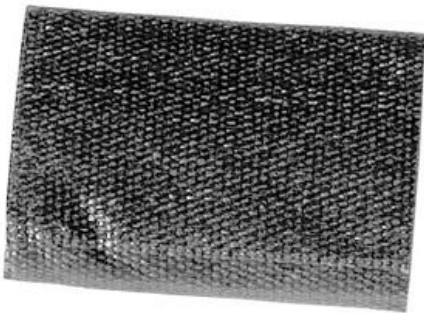
Before you begin this procedure, disconnect battery from logic board. Failure to do so could damage computer.



1. Locate LVDS cable connection to logic board.



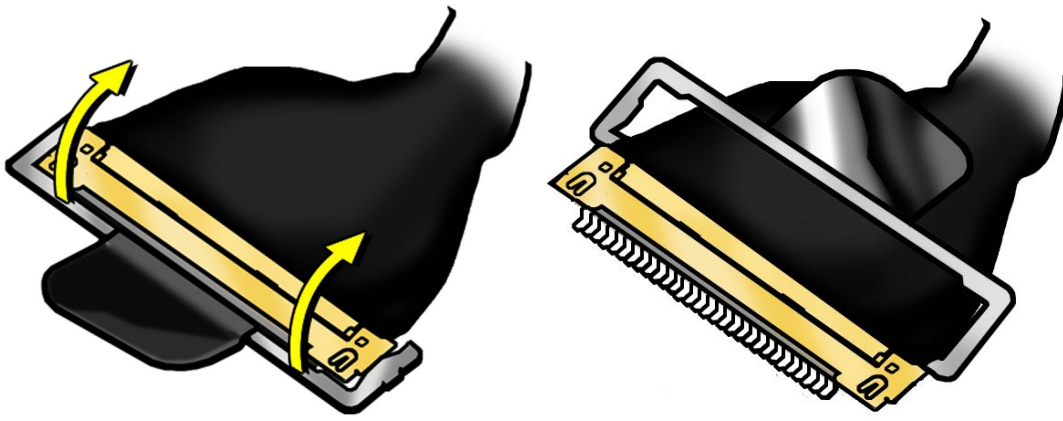
2. Peel EMI gasket (922-8752) off LVDS cable connector, towards fan.



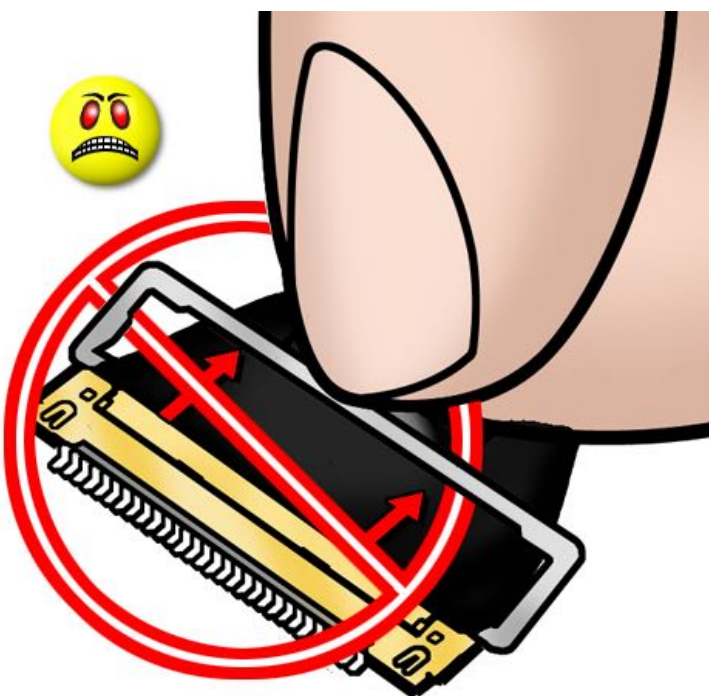
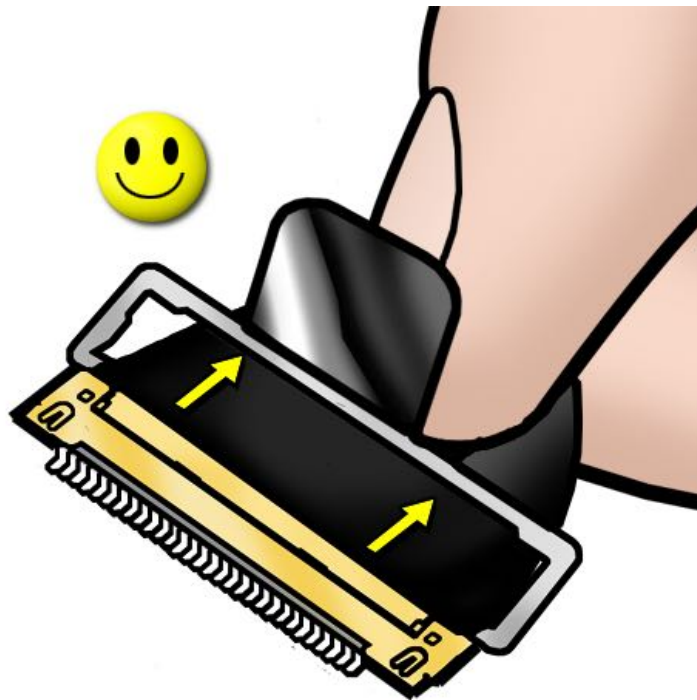
3. Disconnect LVDS cable: grasp black tab and gently swing LVDS lock bar up and back to unlock cable.



**Caution:** Do not pull on black tab or metal lock bar. Pulling on tab to remove LVDS cable will likely result in metal lock bar being torn off cable body. This bar is only to disengage lock from LVDS connector. A broken lock bar results in a display clamshell replacement.



4. Slide cable out of connector by pulling cable. Do not pull black tab or lock bar.





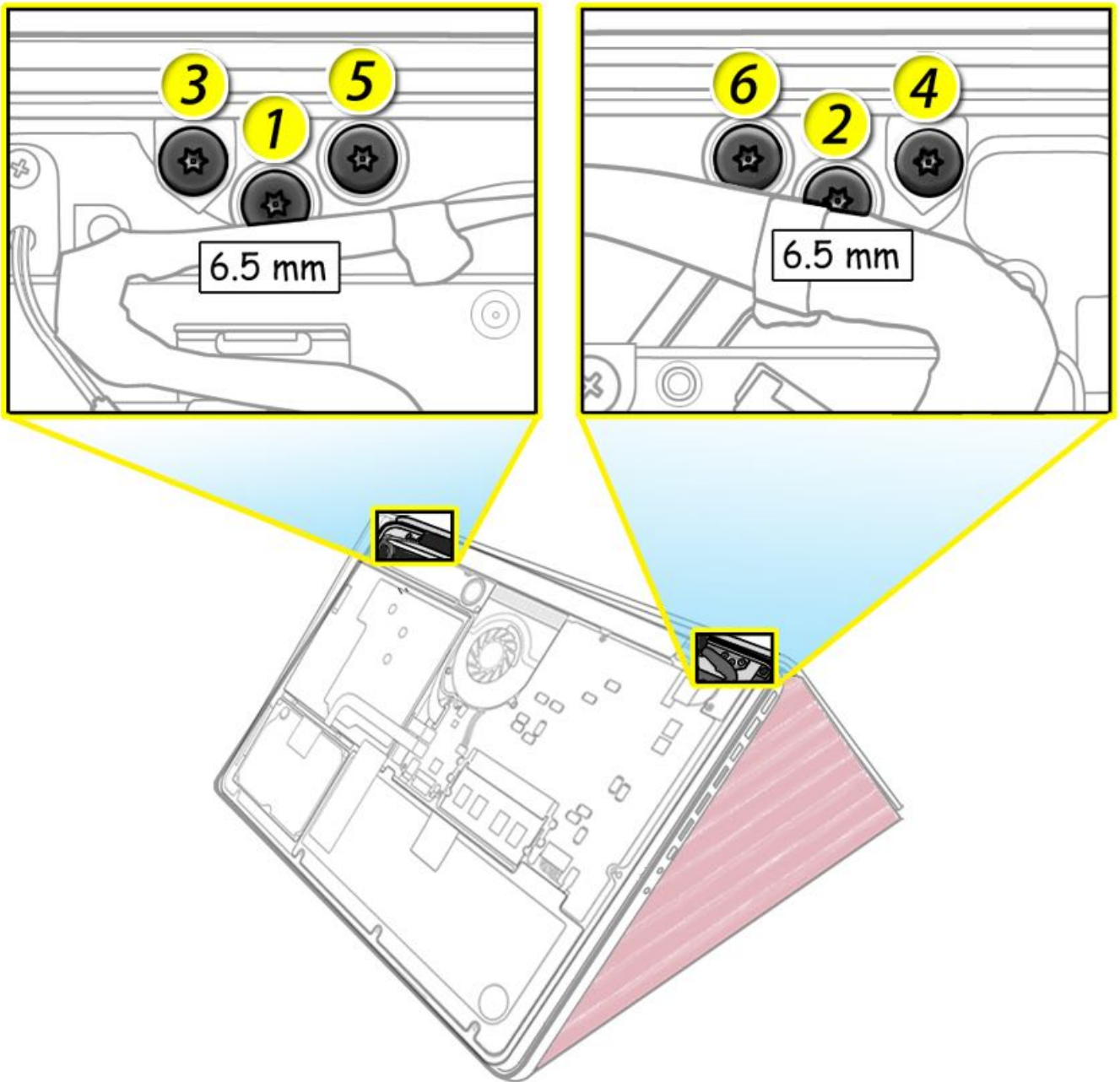
5. Open display to 90 degrees, and place unit on foam wedge service fixture.

6. Remove T8 screws in order shown:

(6) 922-9451 (6.5mm)



7. Separate display clamshell from top case.



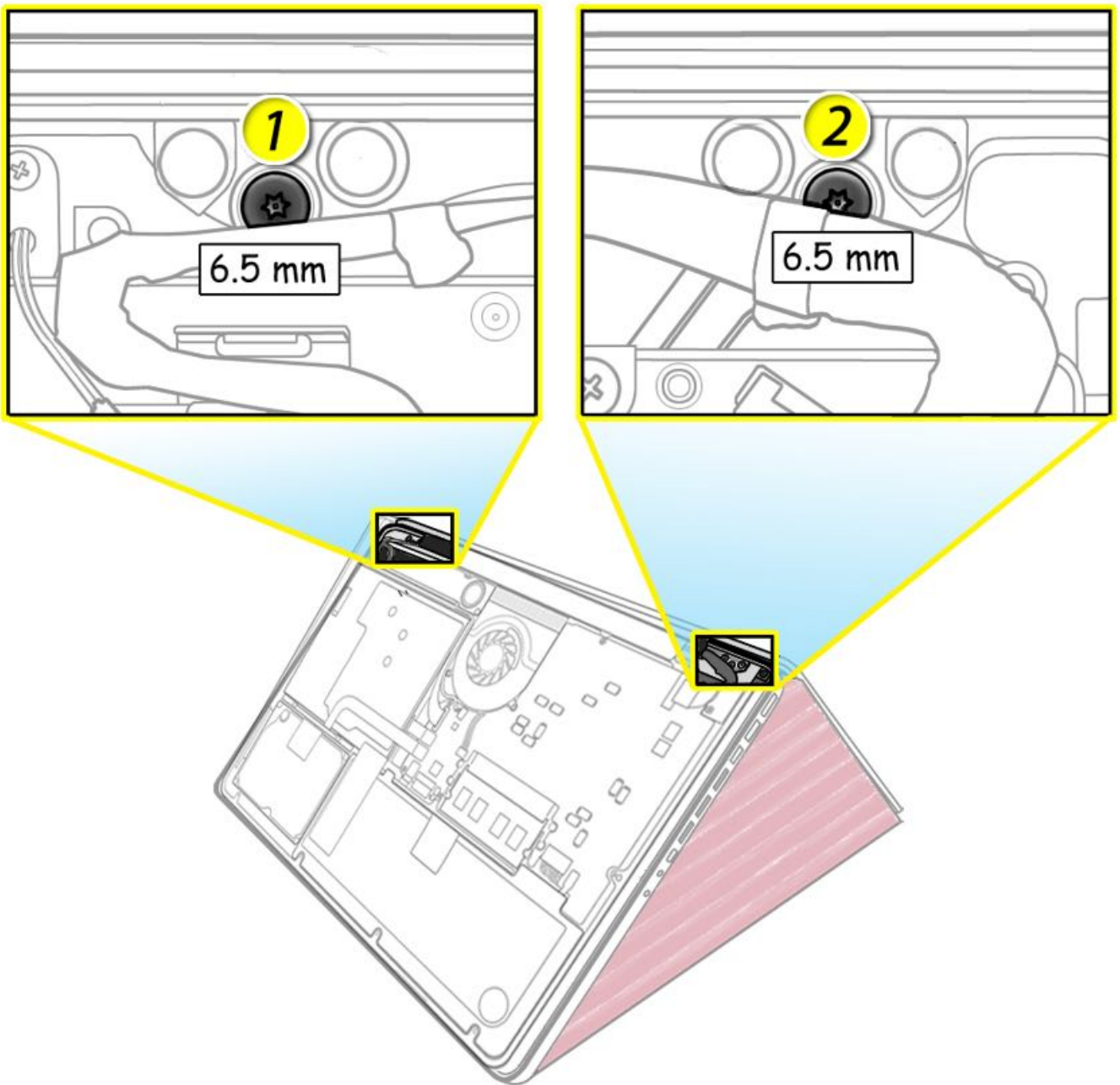
## Steps For Reassembly

### Aligning Display to Top Case

1. Place display on foam wedge service fixture.

2. Install only center screws:

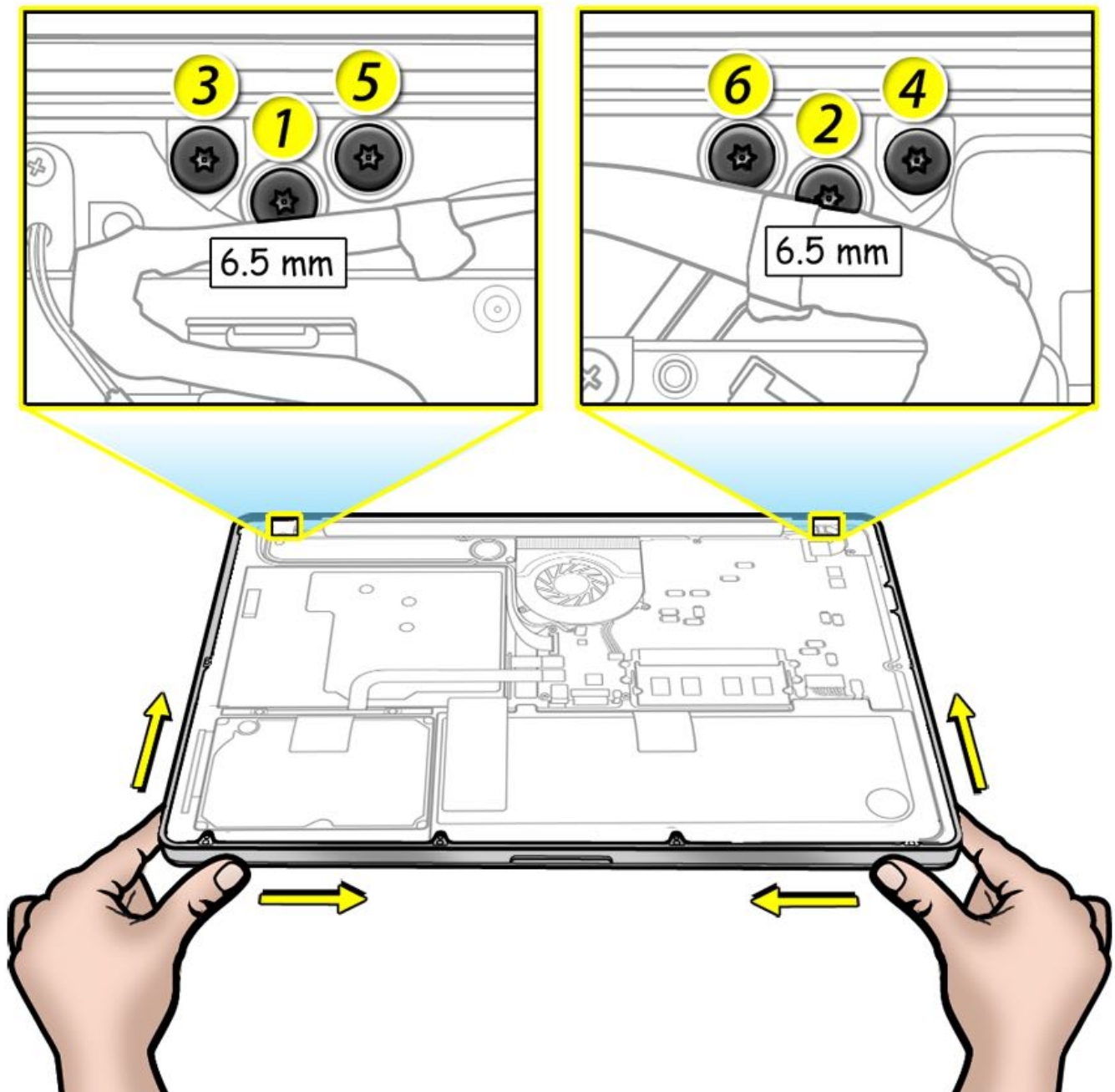
3. Move computer from wedge, and carefully close display.



4. With computer closed and flat on table, check alignment where display clamshell meets top case. If necessary, slightly loosen 2 center screws, adjust alignment, and tighten screws.

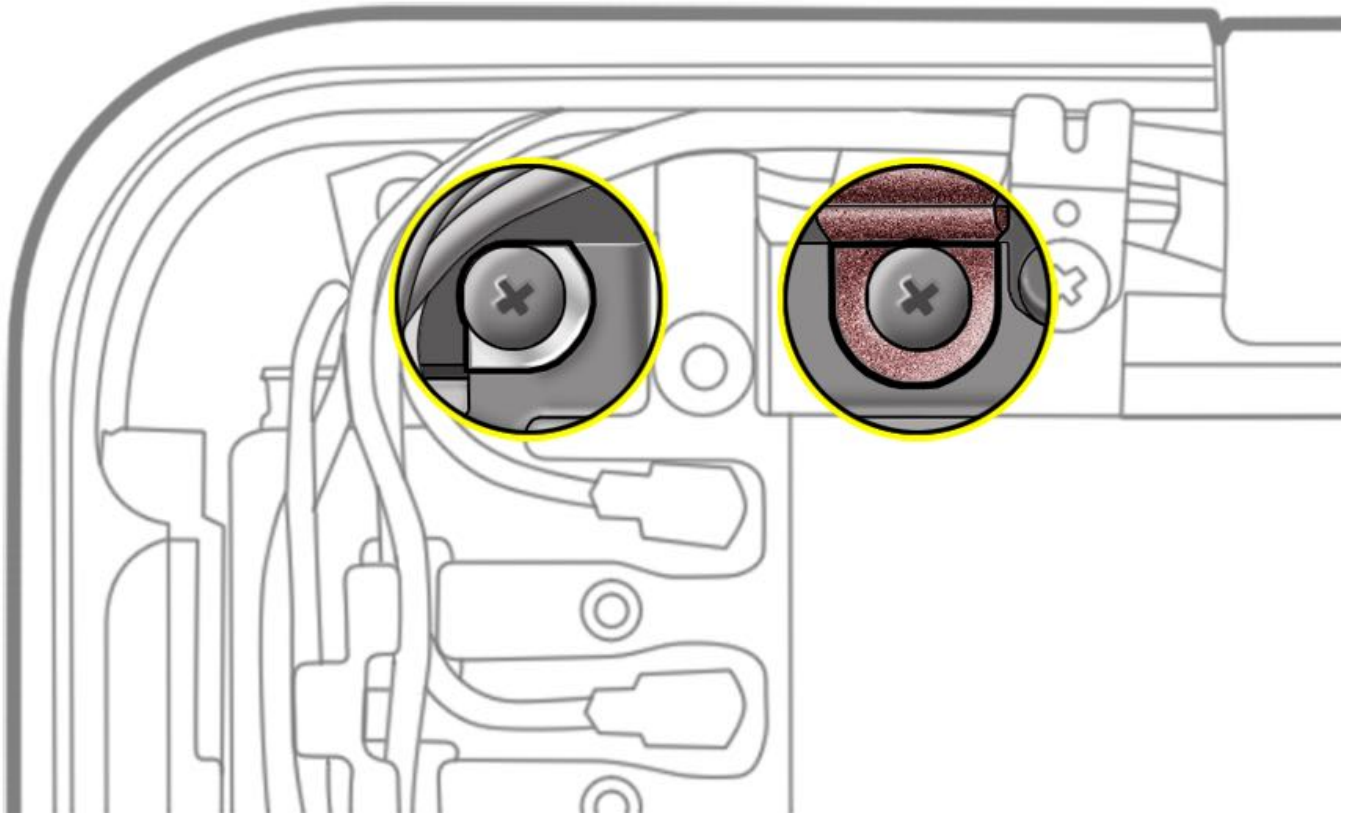
5. Install remaining 4 screws in order shown while computer is still closed.





6. Make sure camera cable is properly routed over end of AirPort/Bluetooth carrier card. Be sure to install grounding cables over the carrier as shown.

**Reassembly Caution:** When connecting LVDS and camera cables, make sure they are fully connected.



### **Display Hinge Behavior**

MacBook Pro models have a unique counterbalanced clutch system which was designed so that when display is vertical with respect to the ground, it will remain in place regardless of the angle of the base.

Moving display past vertical allows hinges to release and display to close. This is normal behavior and no repair is necessary. For more information, and to watch a video of normal hinge behavior, refer to Apple Support article [OP96: MacBook Pro: Display hinge behavior](#).

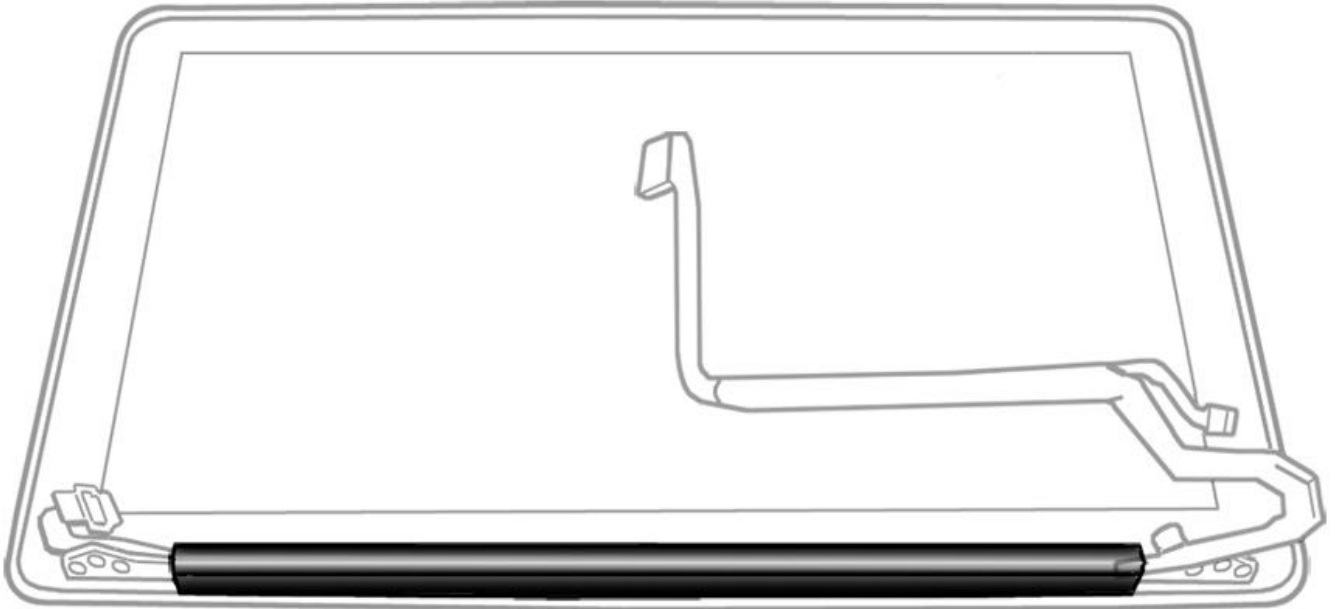


# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Display Clutch Cover

## First Steps

Remove:

- [Bottom Case](#)
- [AirPort/Bluetooth Flex Cable](#)
- [LVDS Cable Guide](#)
- [Display Clamshell](#)



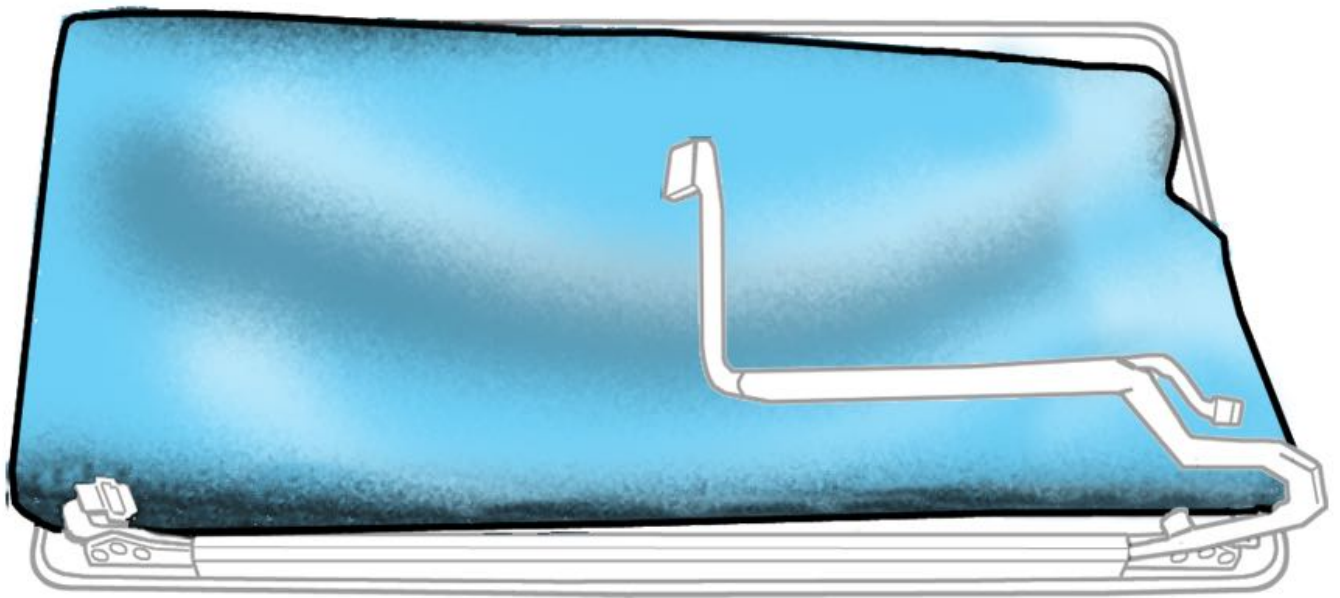
## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth



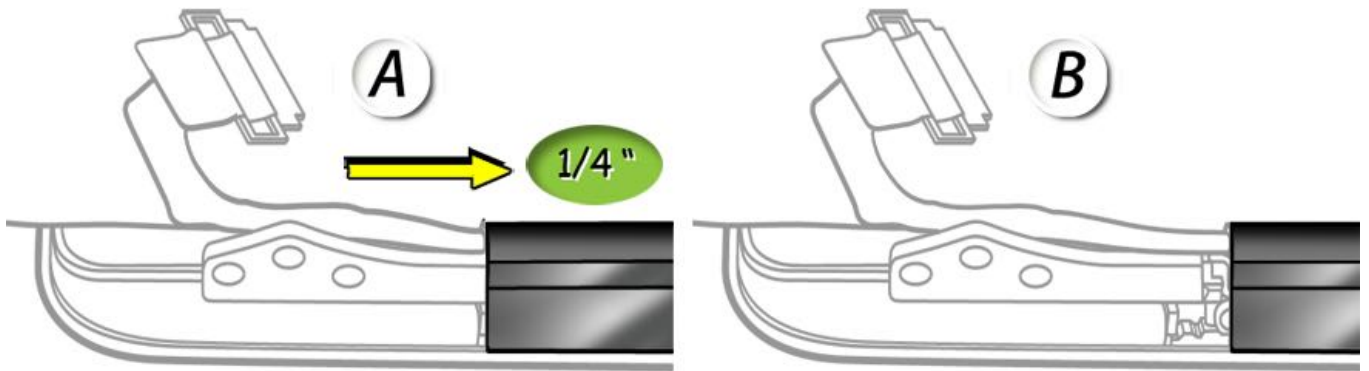
## Steps For Removal

1. Cover display face with clean, soft cloth.



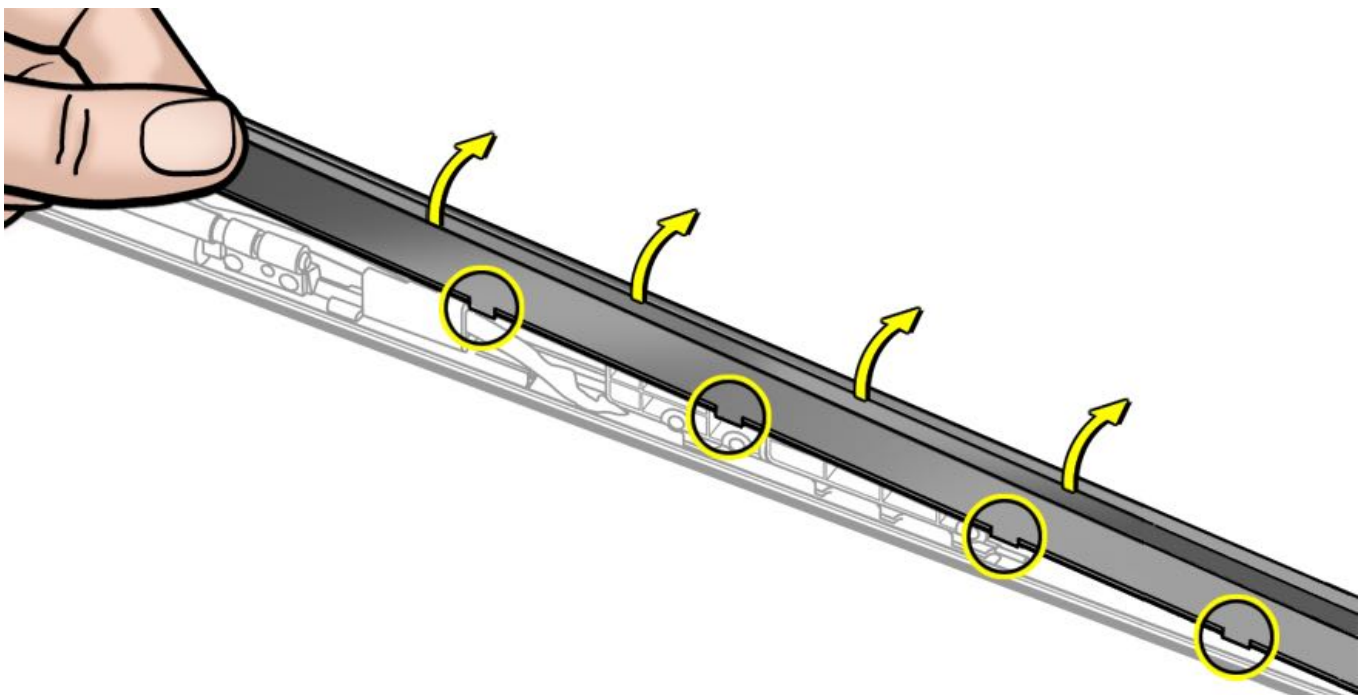
2. Holding left hinge, slide clutch cover 1/4 inch (6.35 mm) away from LVDS cable.

3. Press down on clutch cover to loosen hooks inside.



4. Tilt up end of clutch cover as you **roll it toward display face**.

5. Remove clutch cover.

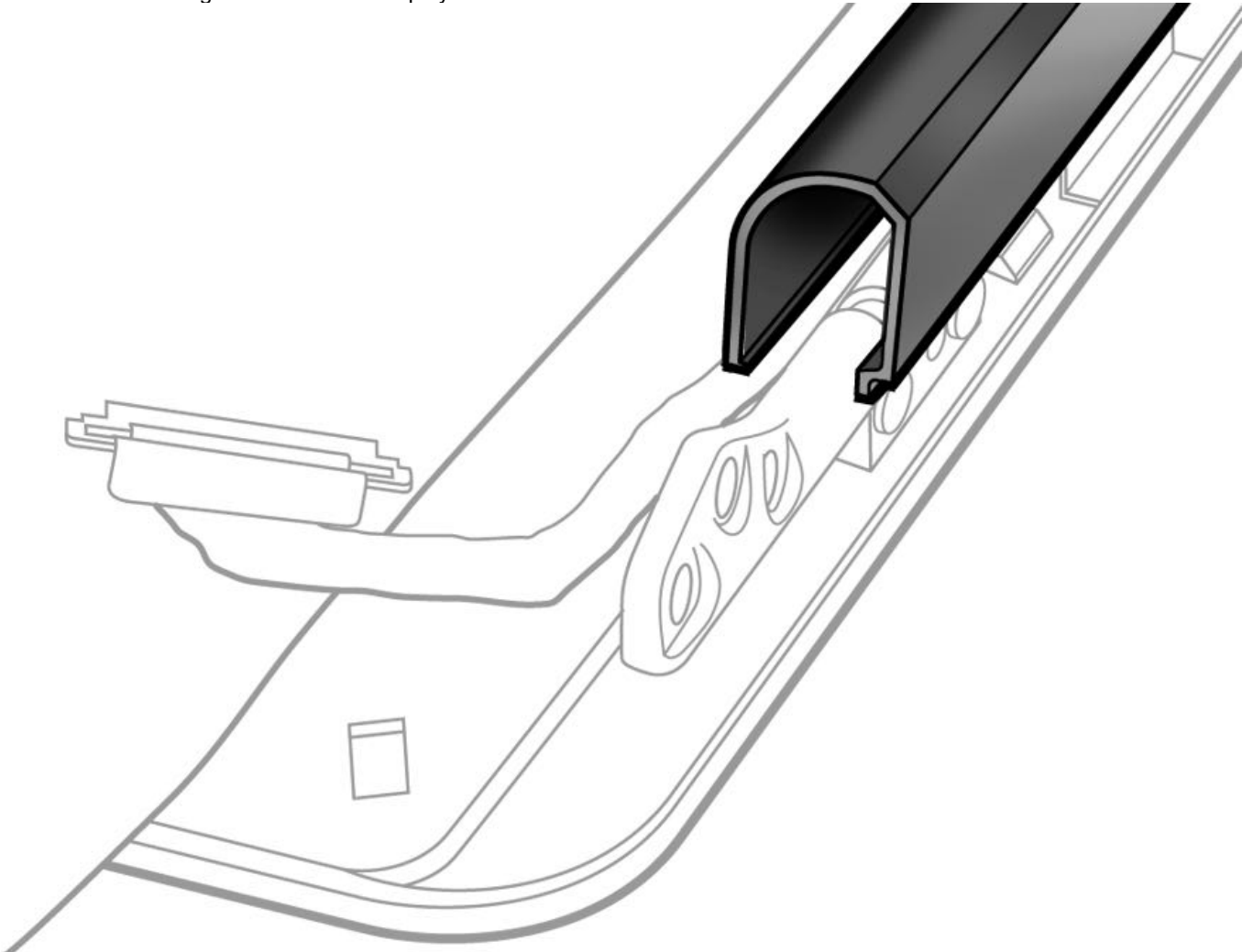


## Steps For Reassembly

1. Note shape of clutch cover:

- flat at bottom
- curved at top

2. Make sure flat edge is at bottom of display.



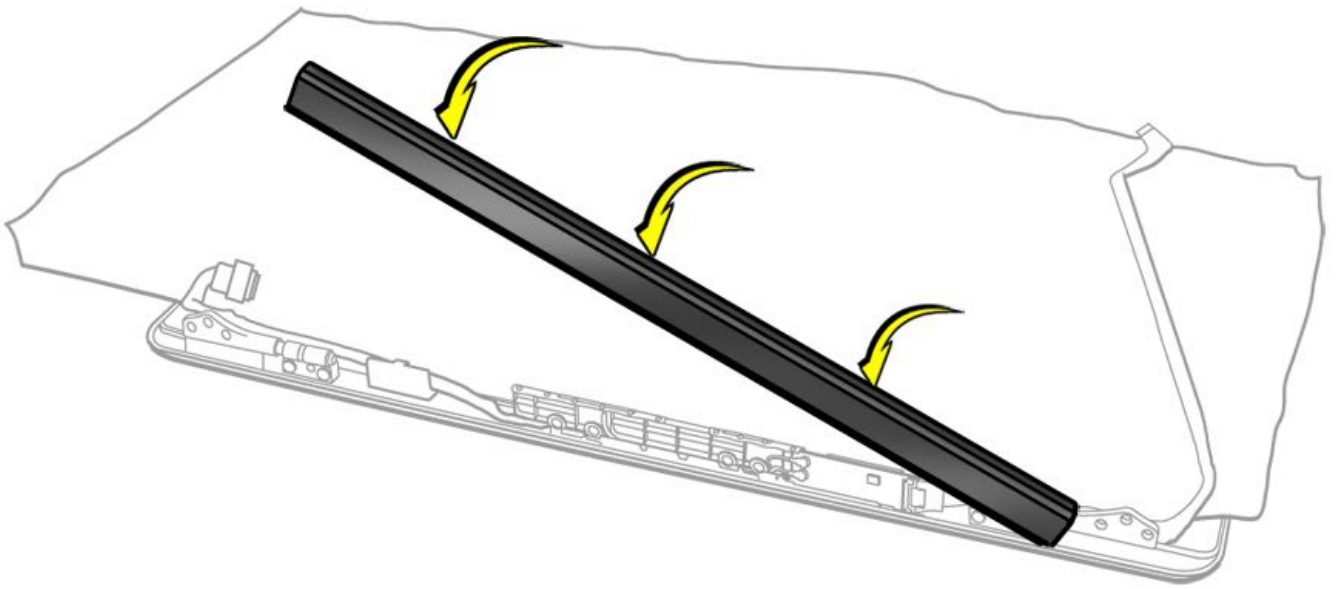
3. Tilt clutch cover onto end with longer cable.

4. Lower clutch cover onto display clamshell.

5. Listen for snapping sound as hooks engage.

6. Check for good fit. Avoid:

- gaps
- bulges
- pinched cables



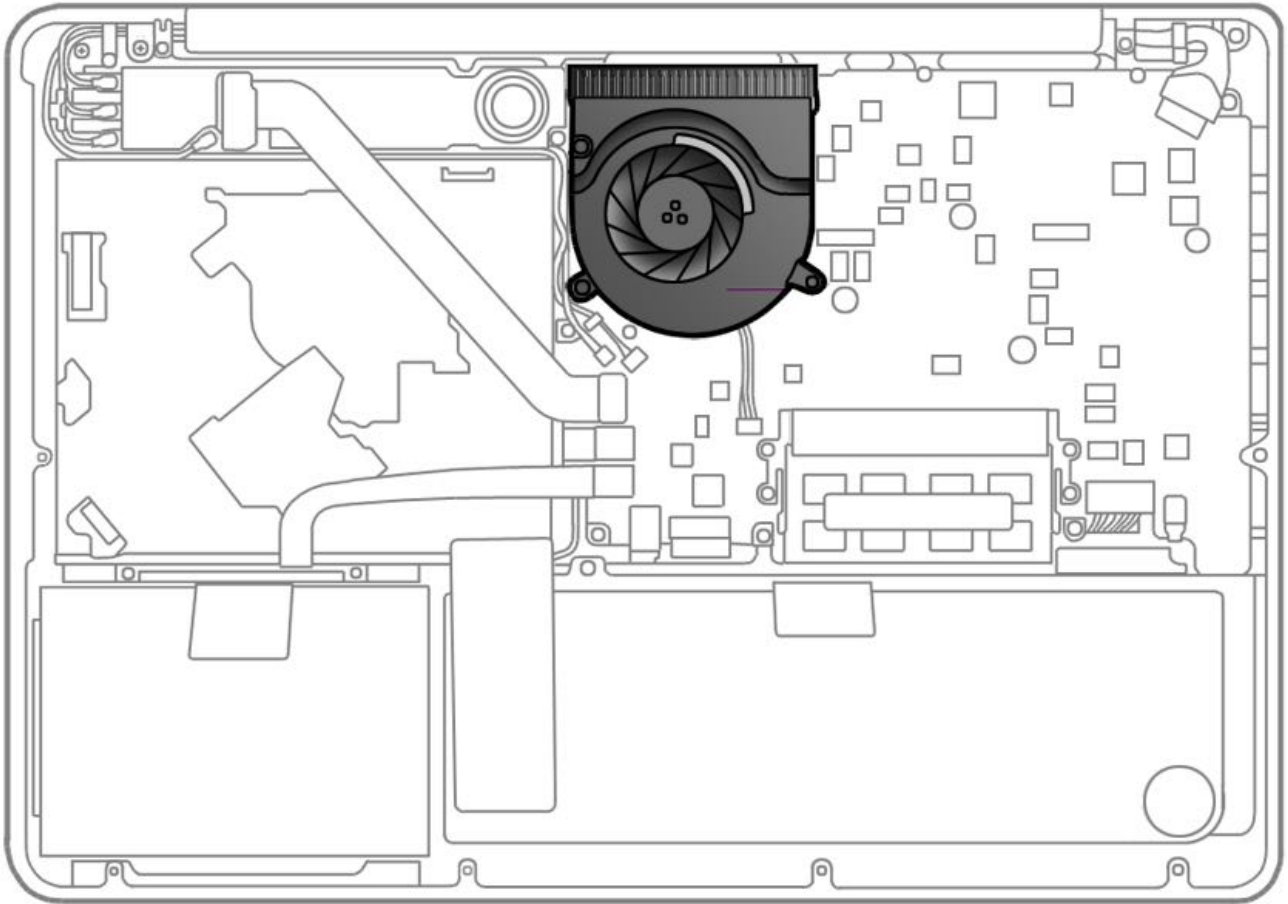


# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Fan

## First Steps

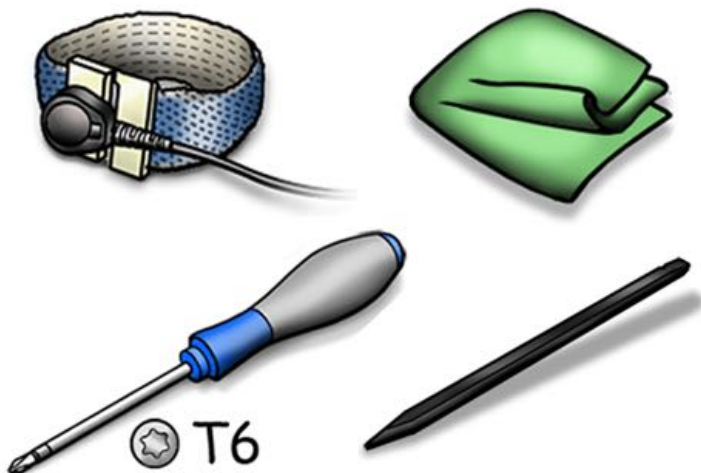
Remove:

- [Bottom Case](#)



## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Black stick
- Torx T6 screwdriver, magnetized

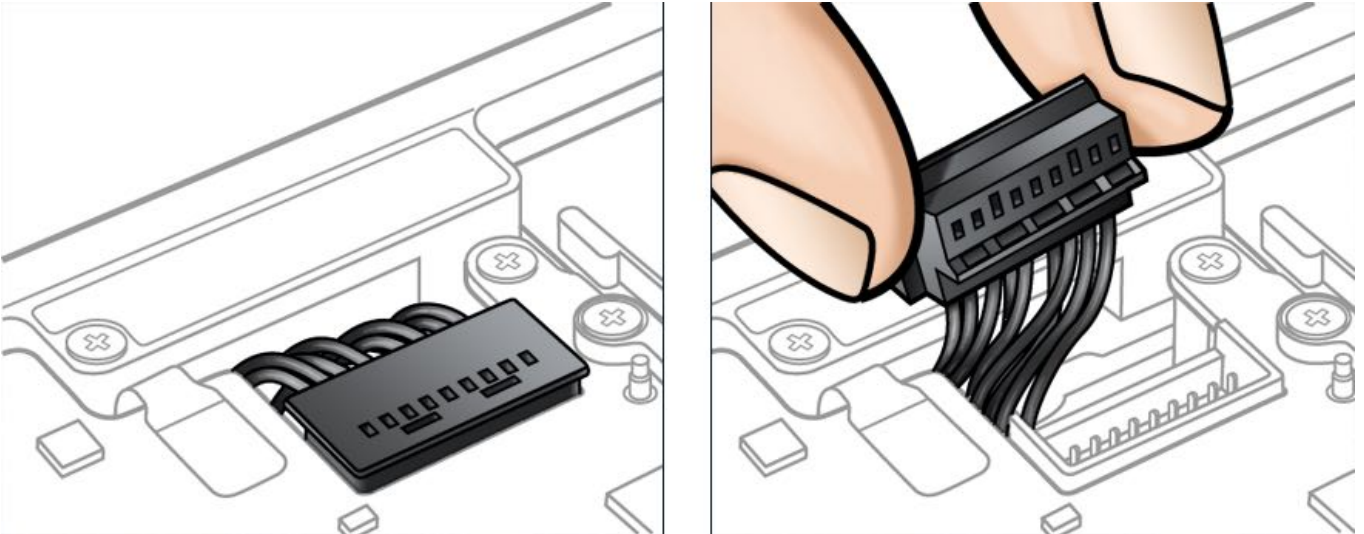


## Steps For Removal





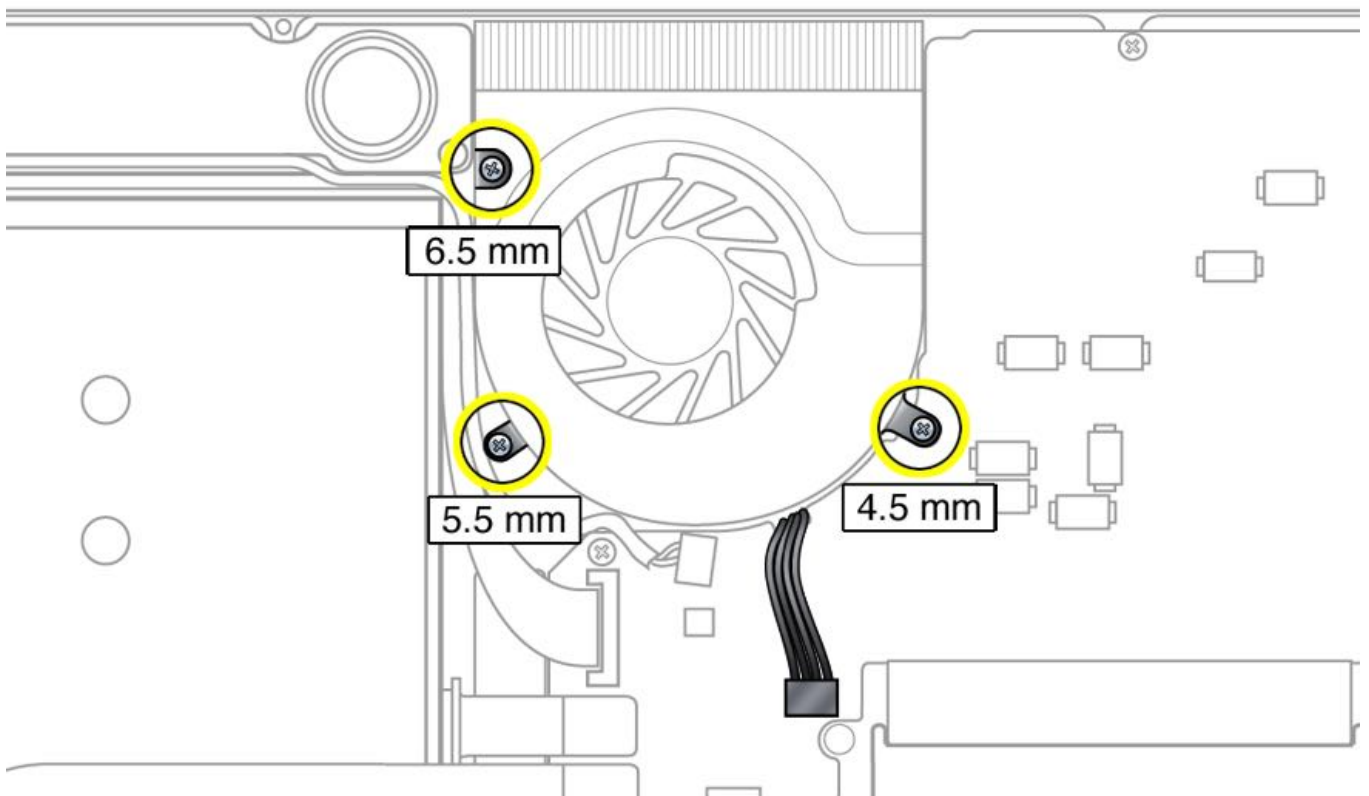
Before you begin this procedure, disconnect battery from logic board. Failure to do so could damage computer.



1. Use black stick to disconnect fan cable from logic board.

2. Remove screws:

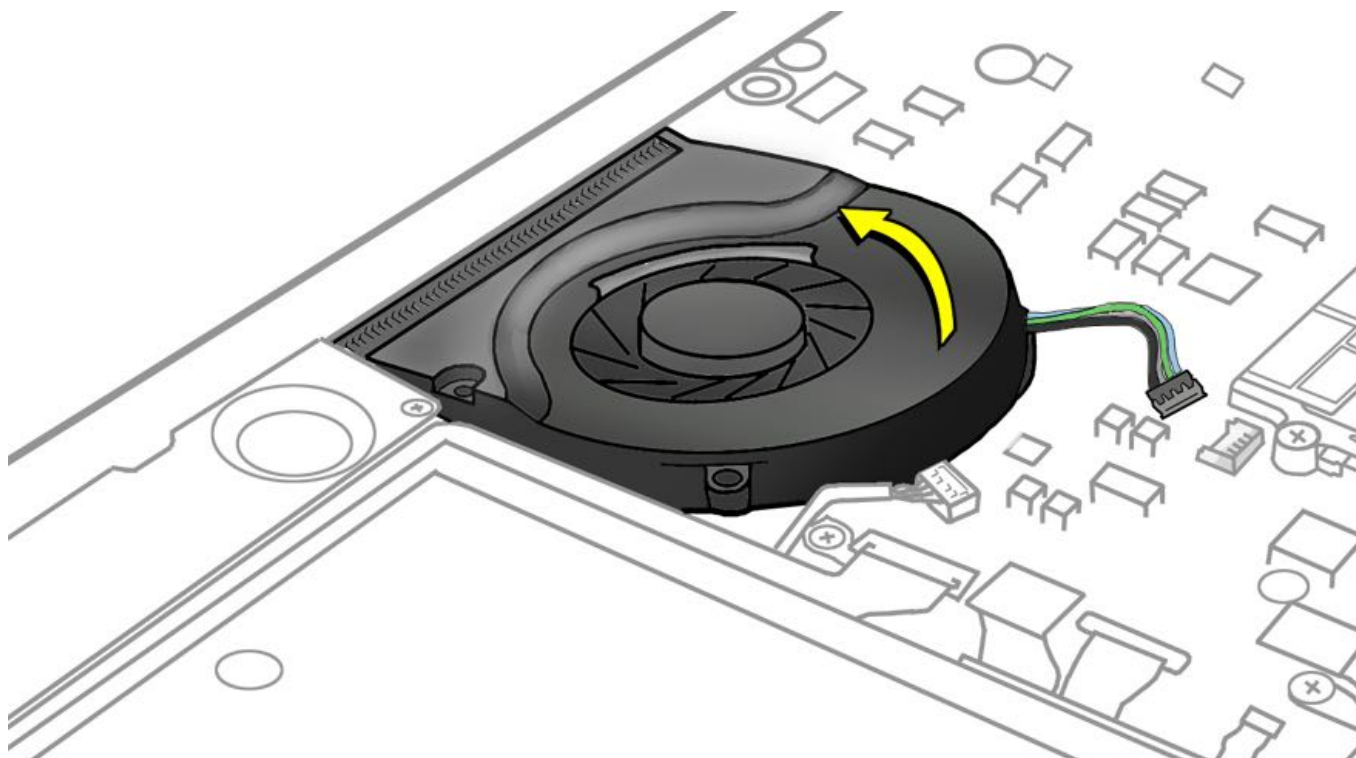
- (1) 922-8645 (6.5mm)
- (1) 922-9455 (5.5mm)
- (1) 922-9454 (4.5mm)



3. Tilt up fan and remove from unit.



**Caution:** Do not touch heat sink.



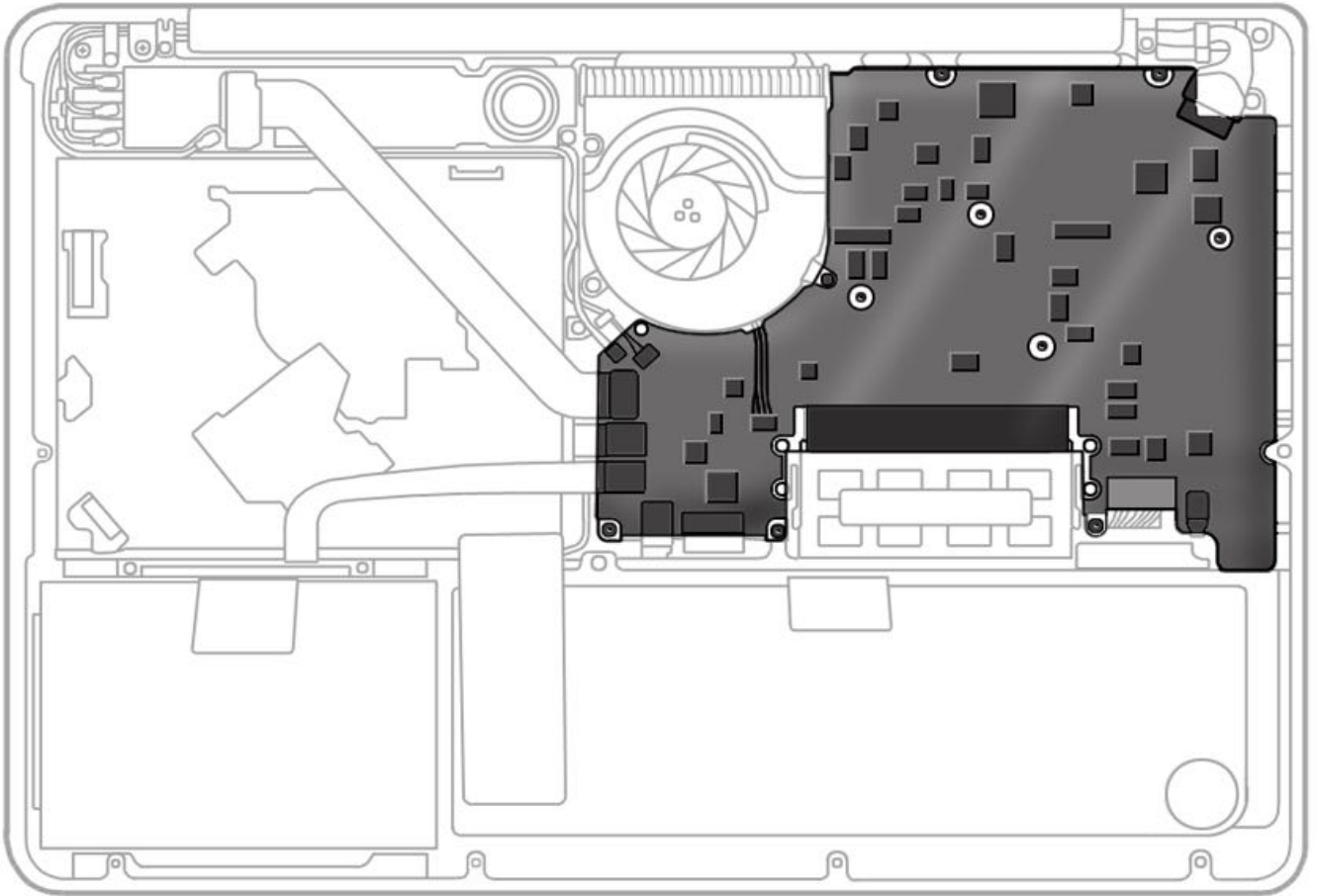
**Steps For Reassembly**

# MacBook Pro (13-inch, Mid 2012): Logic Board

## First Steps

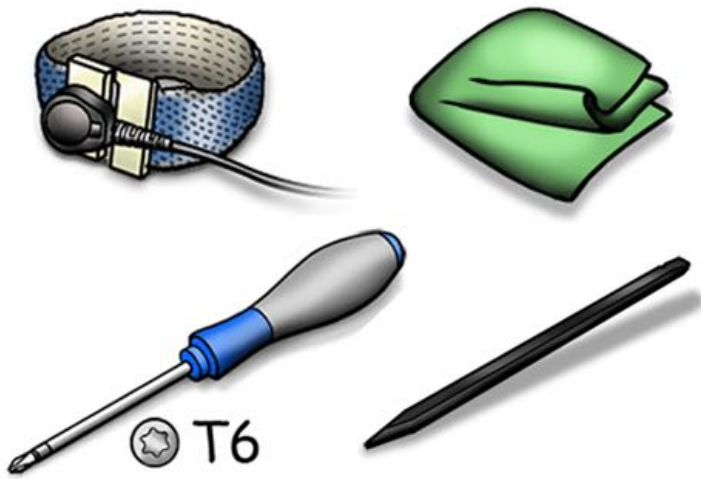
Remove:

- [Bottom Case](#)
- [Memory](#)
- [Fan](#)
- [LVDS Cable Guide](#)



## Tools

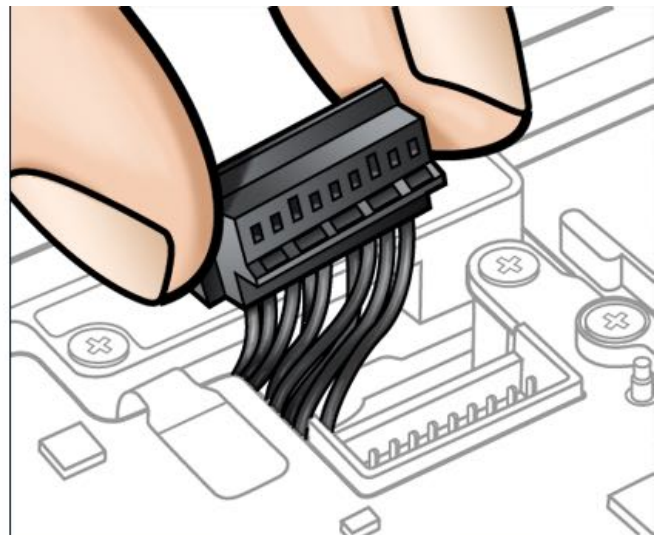
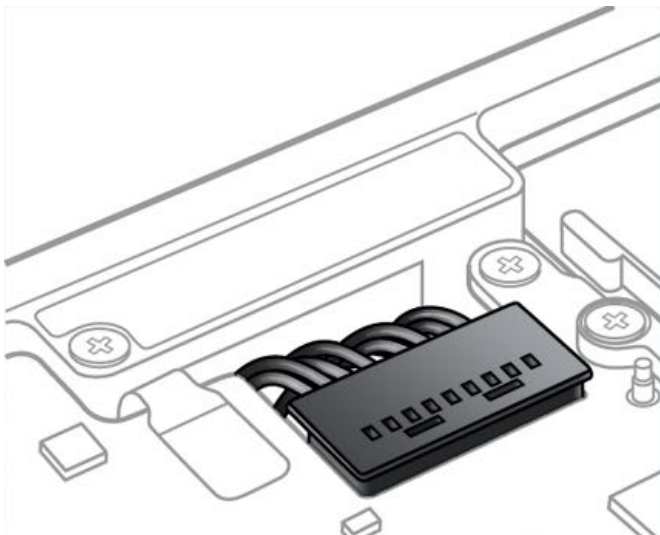
- ESD wrist strap
- Clean, soft, lint-free cloth
- Black stick
- Torx T6 screwdriver, magnetized
- Tweezers (optional)



## Steps For Removal



Before you begin this procedure, disconnect battery from logic board. Failure to do so could damage computer.



**Caution:** Refer to [Connector Types](#) for important shim details.

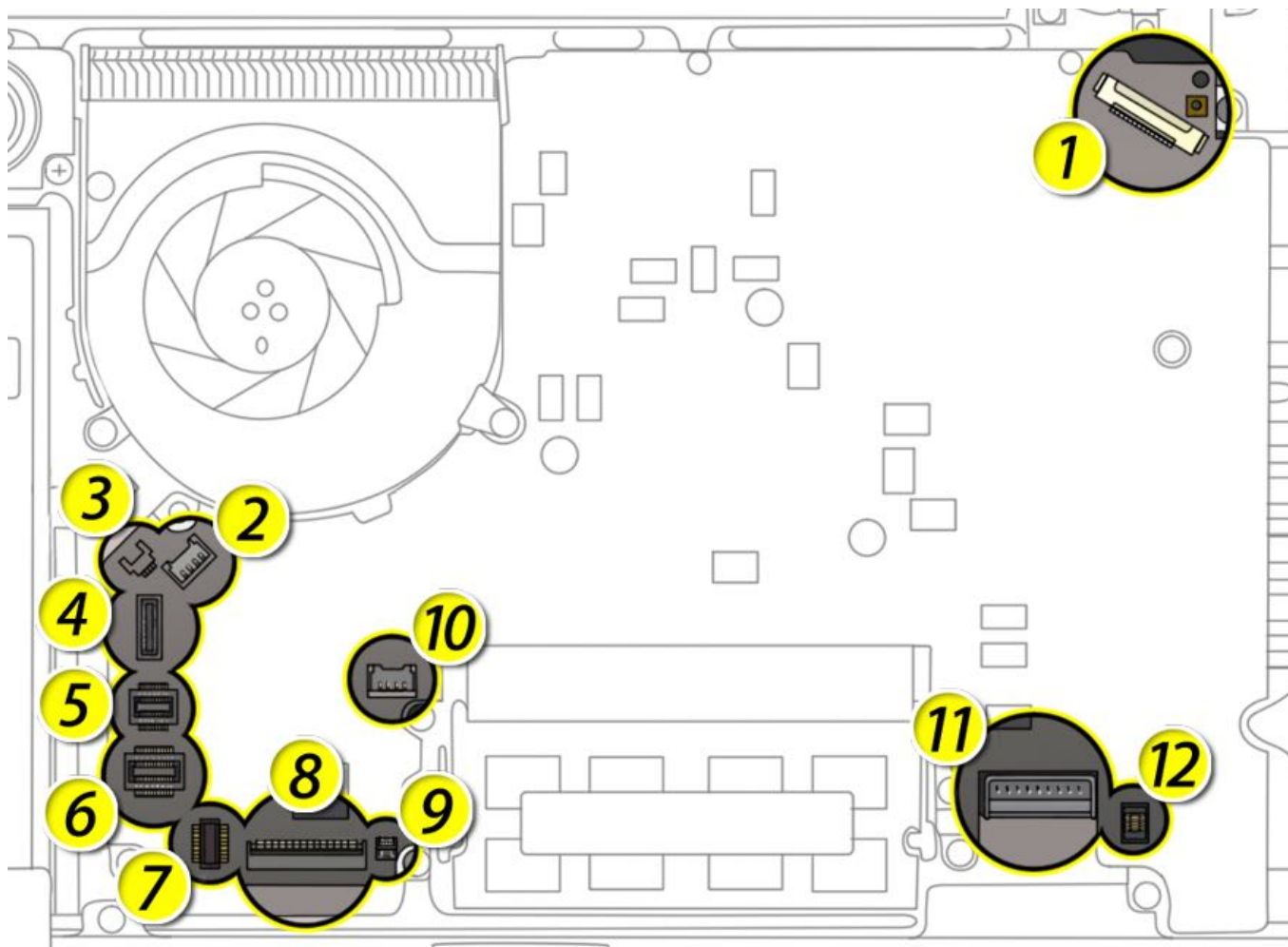
1. Disconnect 9 cables if they haven't already been disconnected:

- 2 locking lever
- 4 platform flex
- 2 low-profile horizontal
- 1 vertical insert

**Note:** You may use plastic tweezers to remove and reinstall locking lever flex cables.

1. LVDS
2. Right speaker
3. Camera
4. Bluetooth
5. Optical drive
6. Hard drive/IR/sleep
7. Trackpad
8. Keyboard
9. Keyboard backlight
10. Fan
11. Battery
12. BIL

**Caution:** The locking levers are fragile. To protect the levers during handling or shipment of the logic board, **close the levers** after the cables are removed. Once the logic board is installed in the top case and the cables are connected, be sure to lock down the levers again.



**Note:** Keyboard backlight flex cable connector is secured with a small black label (922-9460).



2. Remove T6 screws:

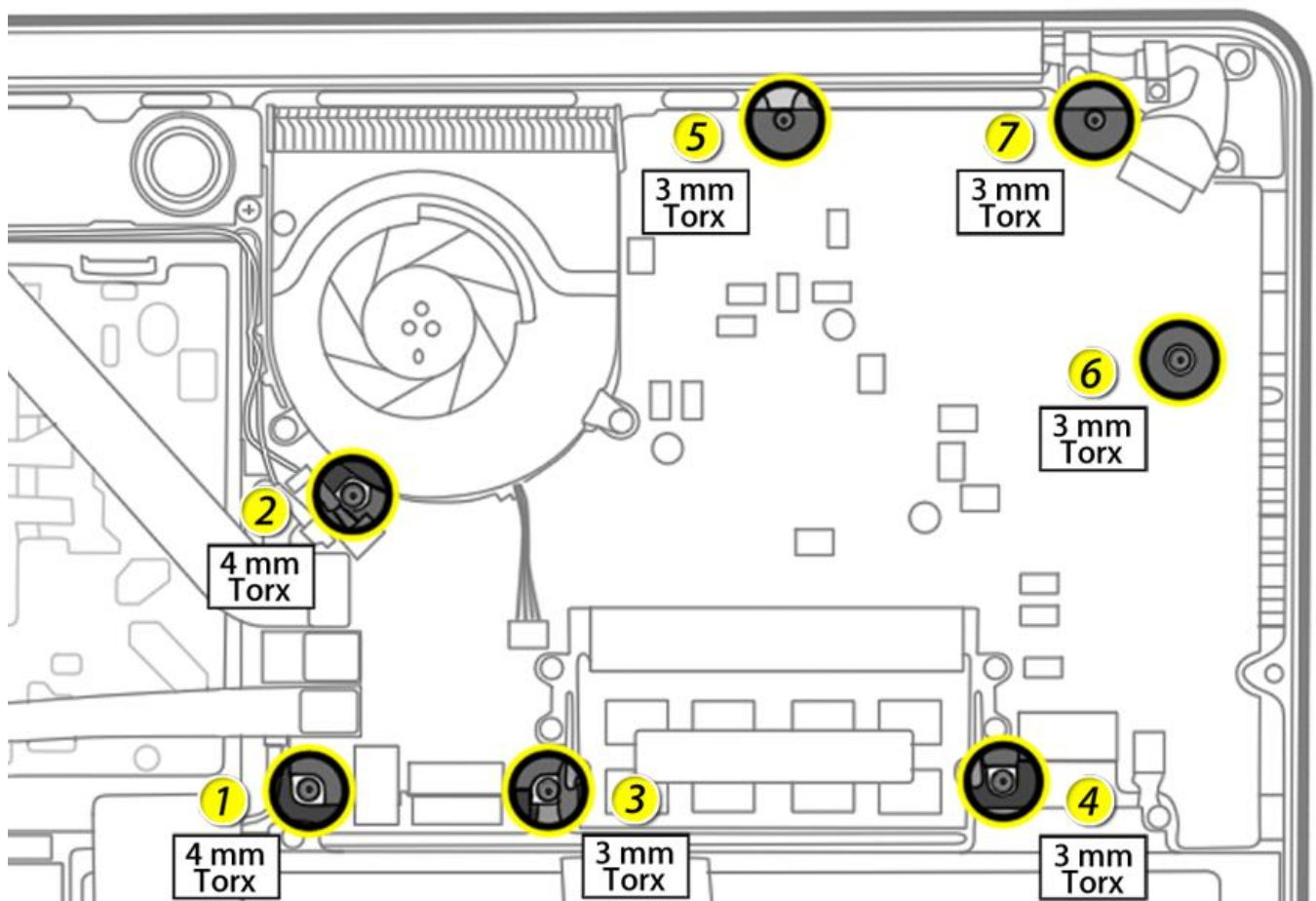
(5) 922-9453 (3mm)



(2) 922-9452 (4mm)

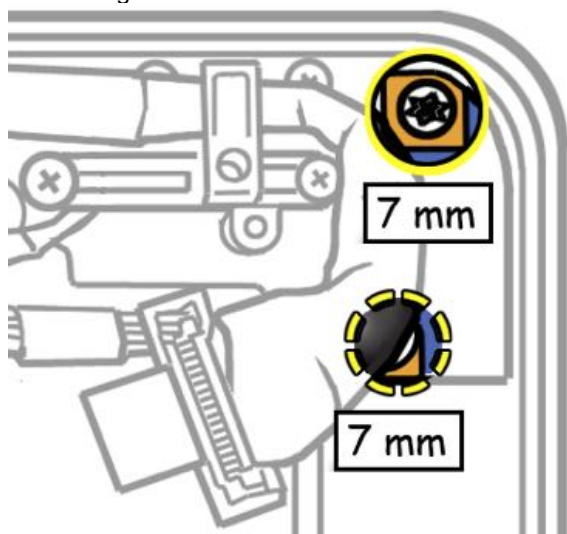






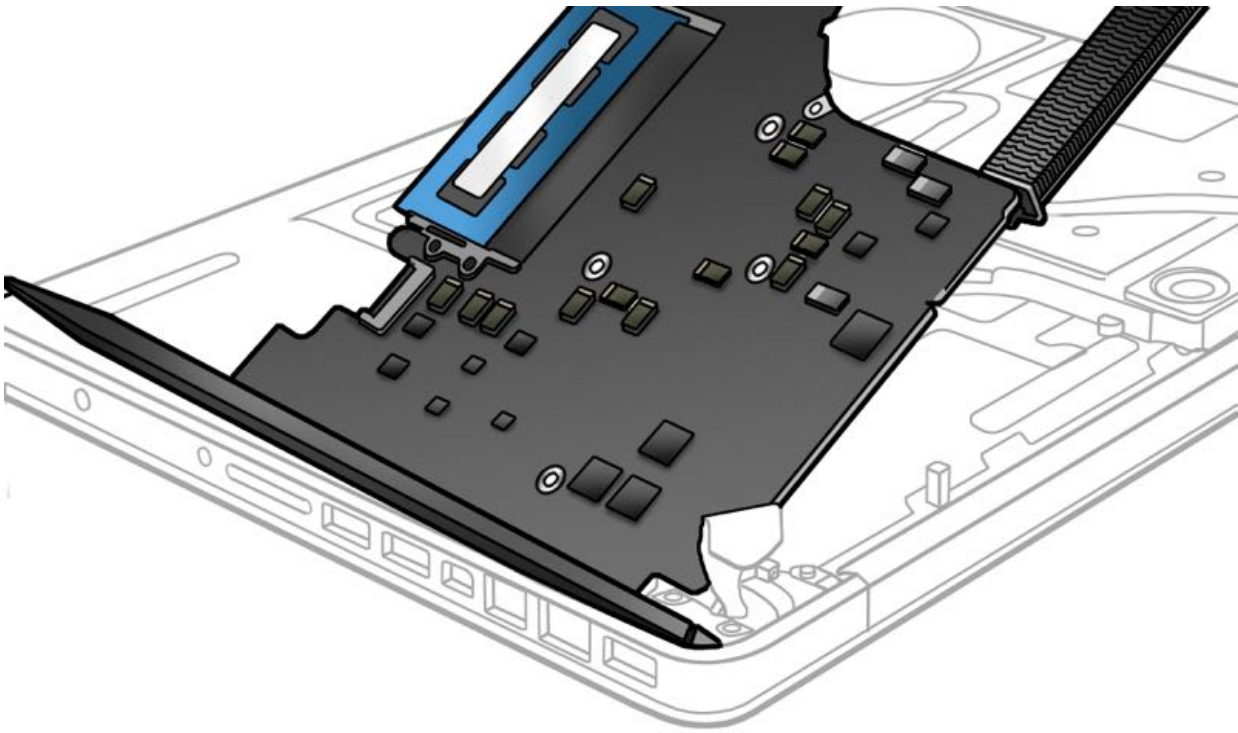
3. Remove two (2) T6 922-9455 (7mm) MagSafe screws.

Leave MagSafe board in.



4. Tilt up left side of board, and pivot logic board away from ports. Use a black stick or your fingers to move the MagSafe board out of the way:

**Caution:** Make sure cables are not pinched.



5. Tilt board vertically and locate on back side of logic board:

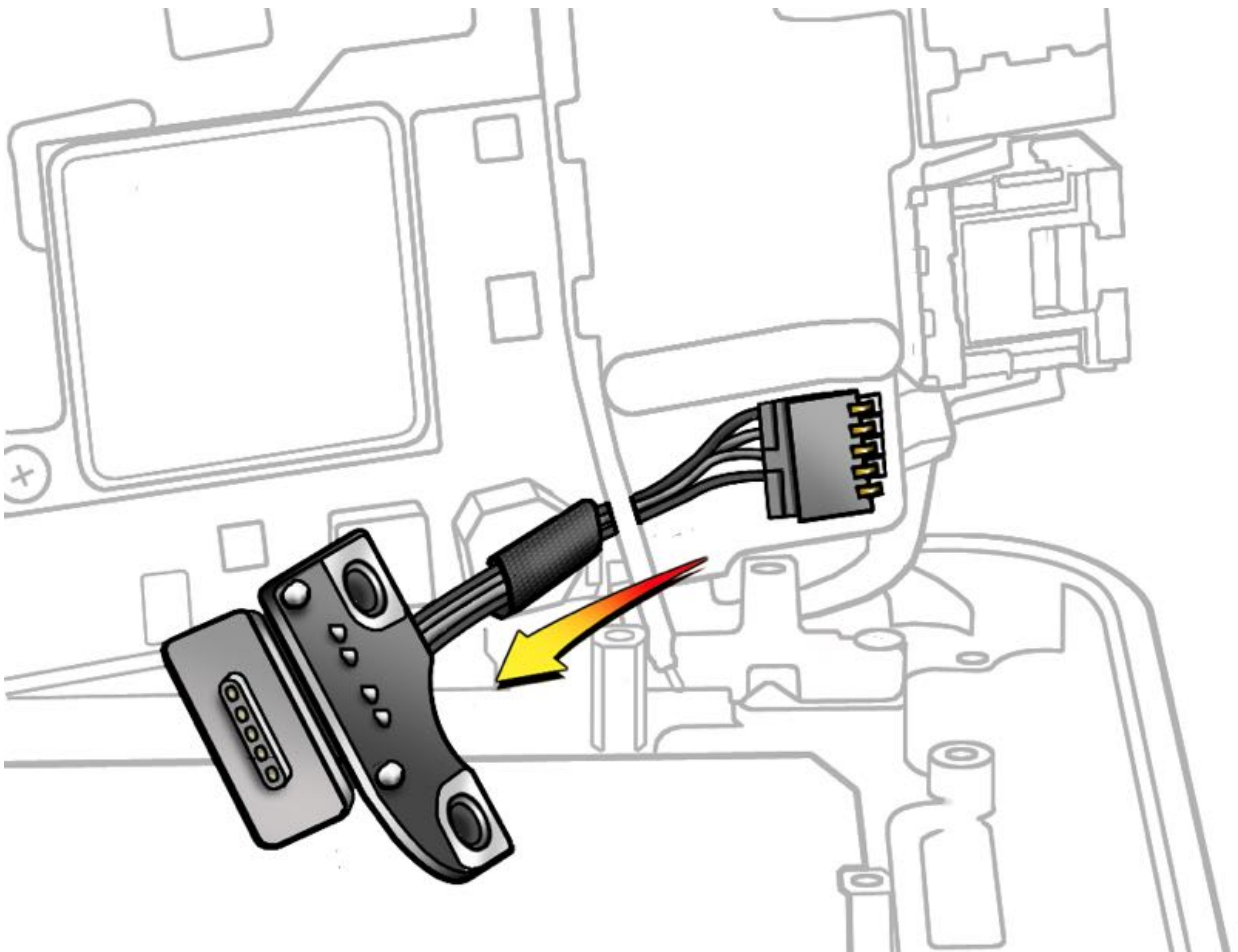
- Microphone cable
- MagSafe board cable

**Note:** Microphone cable runs underneath left speaker cable. MagSafe cable wraps around microphone cable.

6. Move the MagSafe to the left of the microphone cable.

**Caution:** Be careful not to strain or pinch microphone cable.

**Reassembly Note:** If tape covers microphone connector, reapply tape or use Kapton tape.

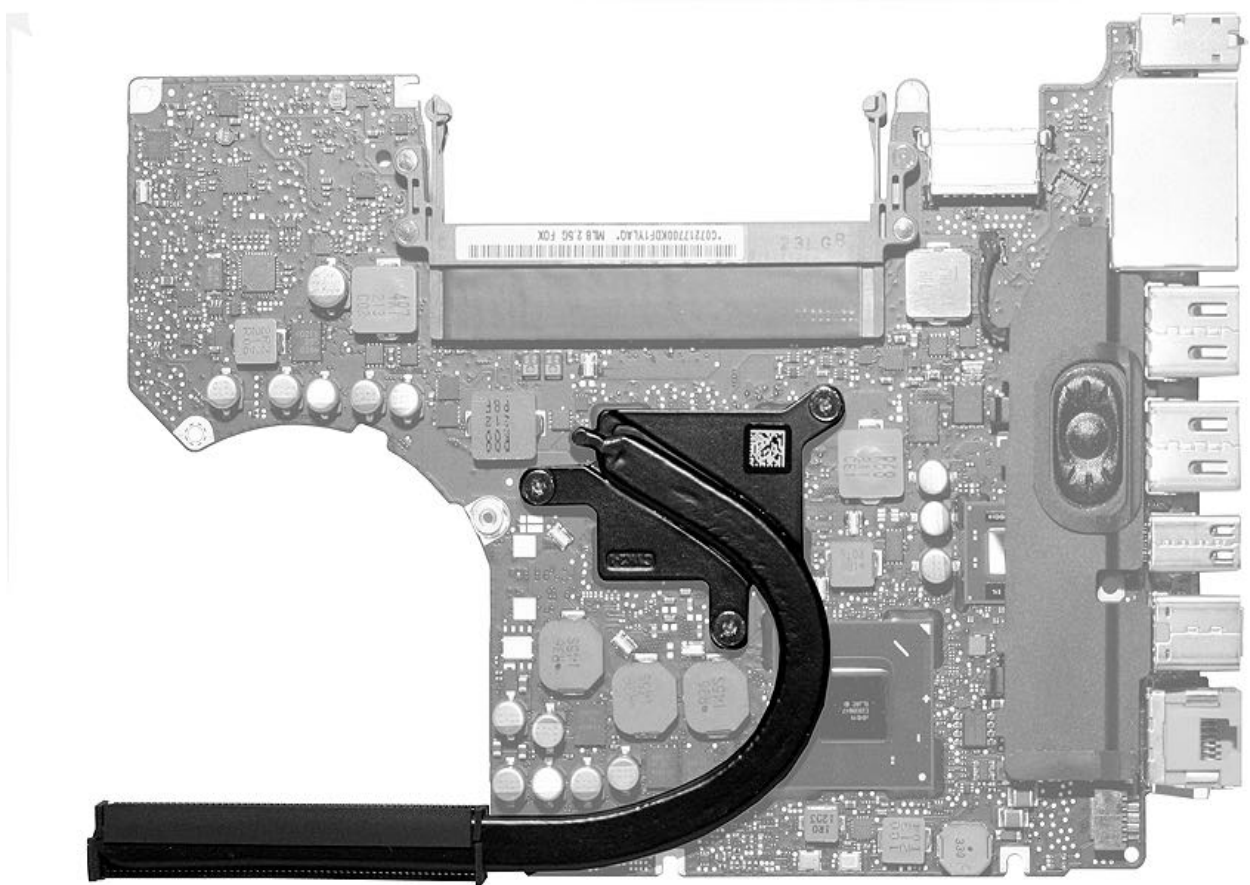


7. Unplug and remove microphone cable from left speaker .

**NOTE:** Push the logic board past the clutch cover, with the logic board edge resting on the ESD mat, even with the top of the display clamshell. Only from here will there be enough slack on the microphone cable to prevent damage.



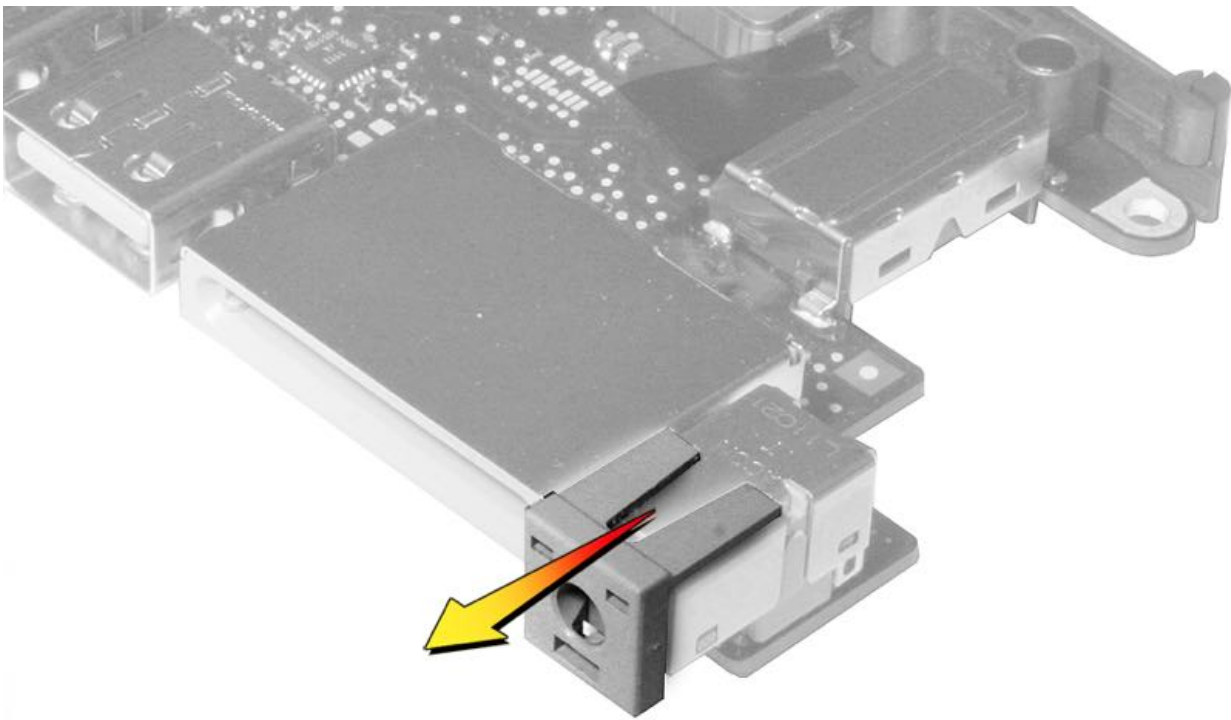
**NOTE:** If replacing logic board with a new one, transfer left speaker and heat sink. Take care not to rip foam pads on left speaker when removing from old logic board.



**Note:** New replacement logic boards may have a protective plastic cap installed on the headphone jack assembly.

Remove plastic cap before installing logic board. The logic board will not fit with the cap in place.





Transfer headphone jack cap to replaced logic board before sending logic board back to Apple.



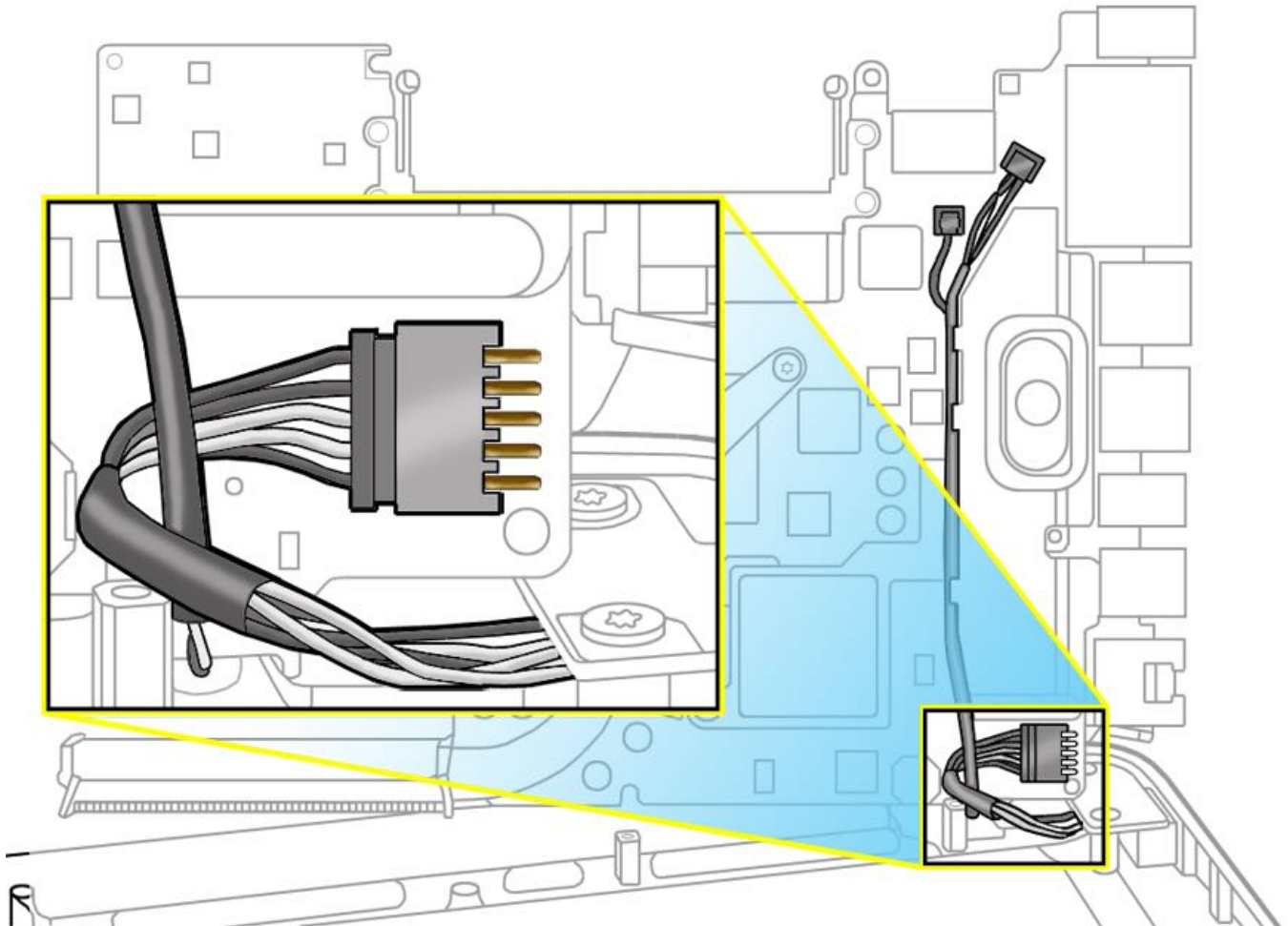
## Steps For Reassembly

1. If you're replacing the logic board: Install the left speaker, the heat sink from the old logic board, and insert the MagSafe cable.
2. Place logic board in the same position as the removal procedure by aligning the logic board vertically on the ESD mat, and connecting the microphone cable and speaker cable.

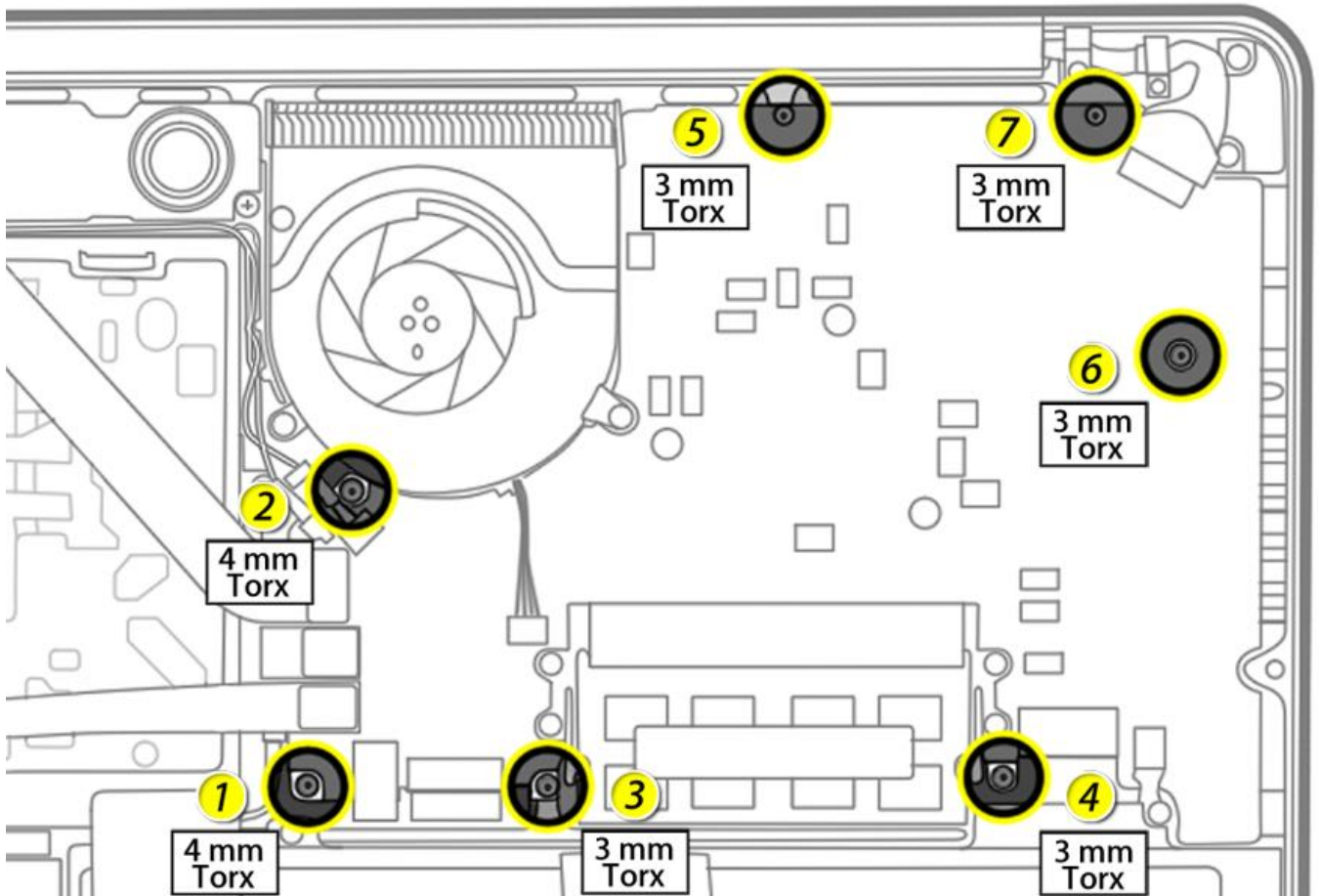


3. Loop MagSafe cable around the microphone cable. Do not screw MagSafe board down yet.

Tilt board into top case, make sure no cables are pinched. Then screw down MagSafe board.

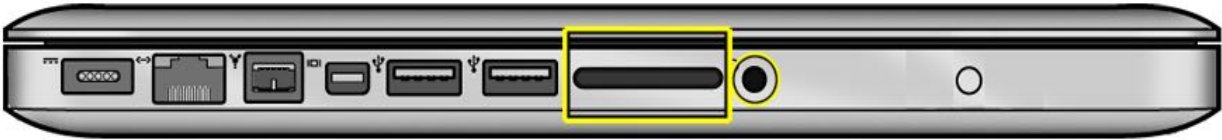


4. Install front screw bracket and screws in order shown.



5. Check that ports align with top case. Insert an SD card into SD slot and an audio connector to ensure proper alignment.

- 



# MacBook Pro (13-inch, Mid 2012): Left Speaker

## First Steps

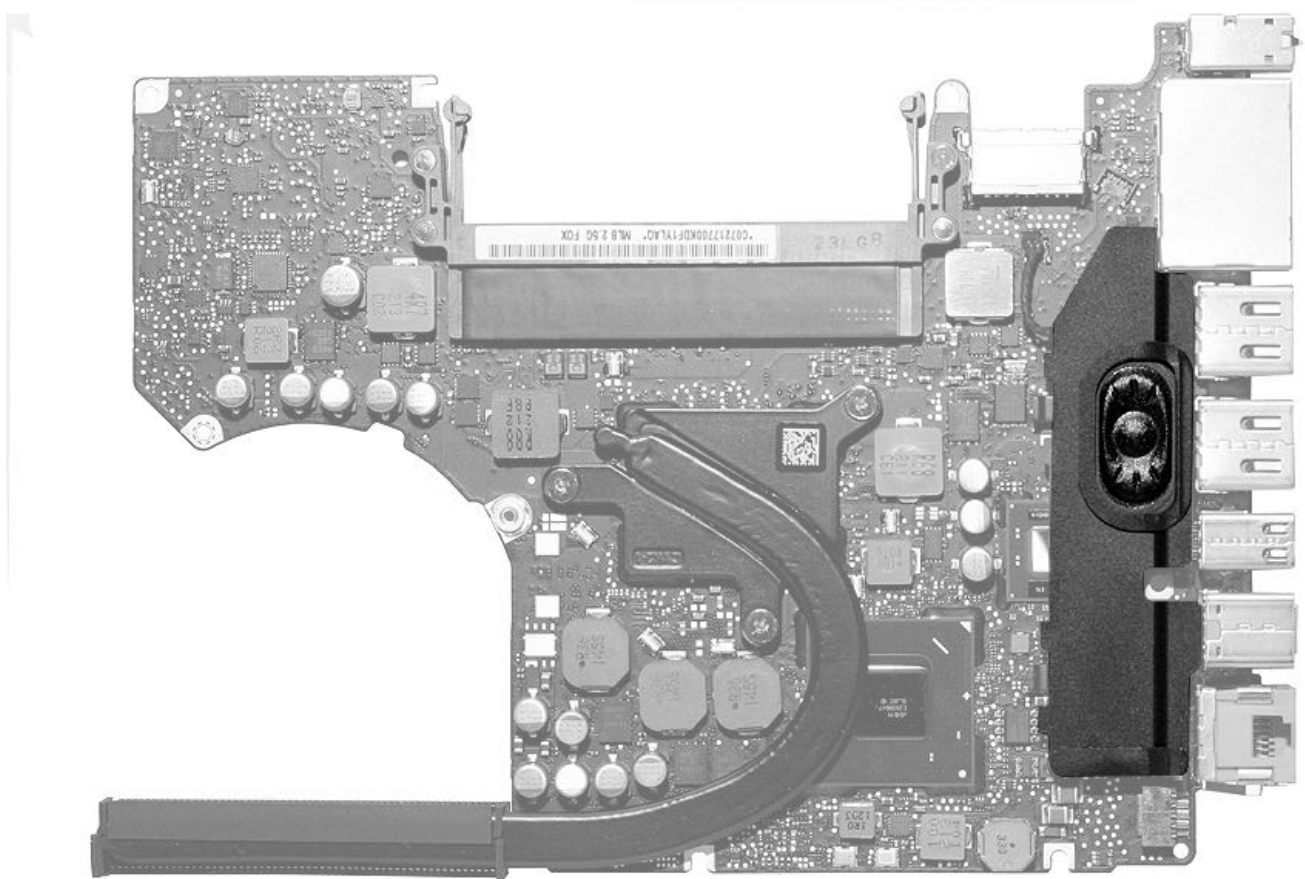
Remove:

- [Bottom Case](#)
- [Memory](#)
- [Fan](#)
- [Logic Board](#)

**Note:** Left Speaker is attached to bottom side of logic board.

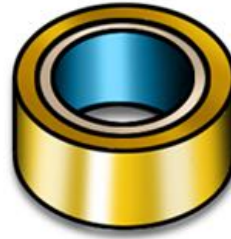


**Caution:** Do not touch soft speaker cone. Do not touch heat sink or gold connectors.



## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Kapton tape



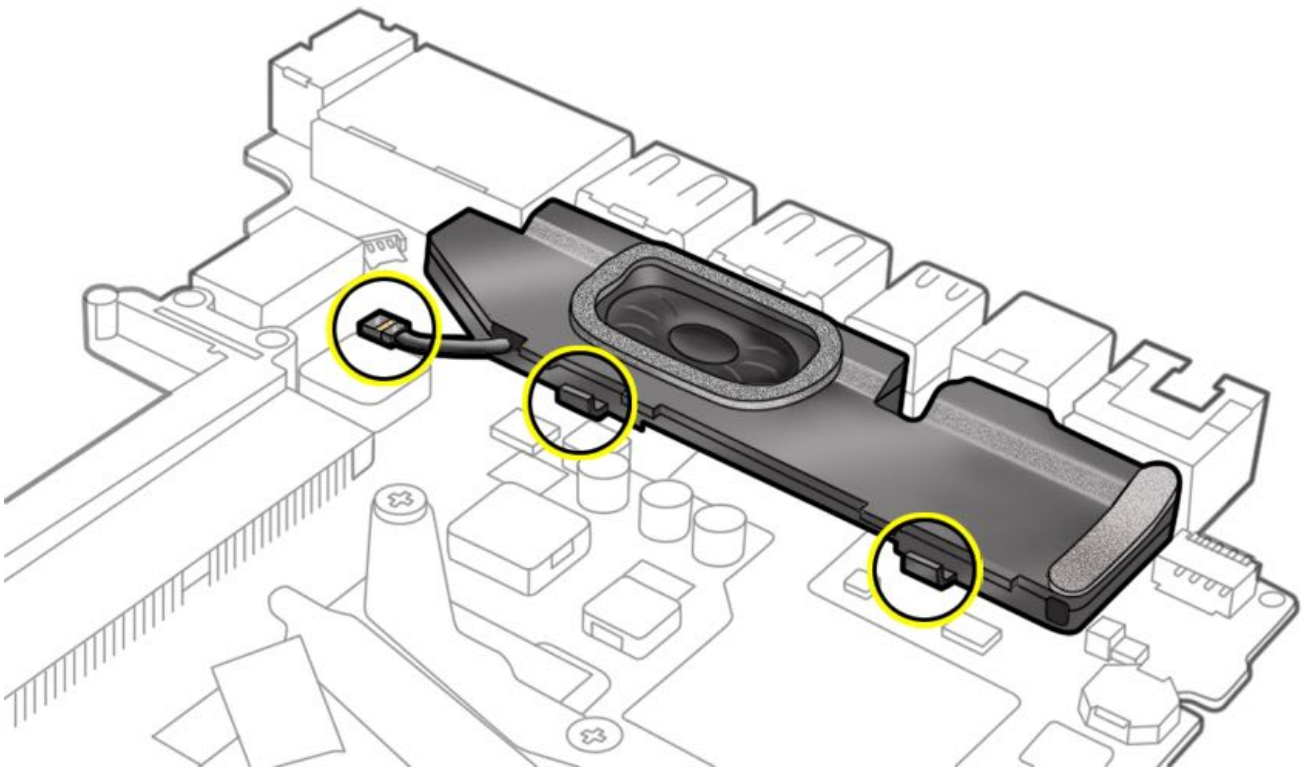
## Steps For Removal

1. Disconnect speaker cable from logic board.

**Reassembly Note:** If tape covers speaker connector, reapply tape or use Kapton tape.

2. Lift speaker by cable guide tabs.

**Caution:** If transferring left speaker to a new logic board, take care not to rip foam pads when removing from old logic board.

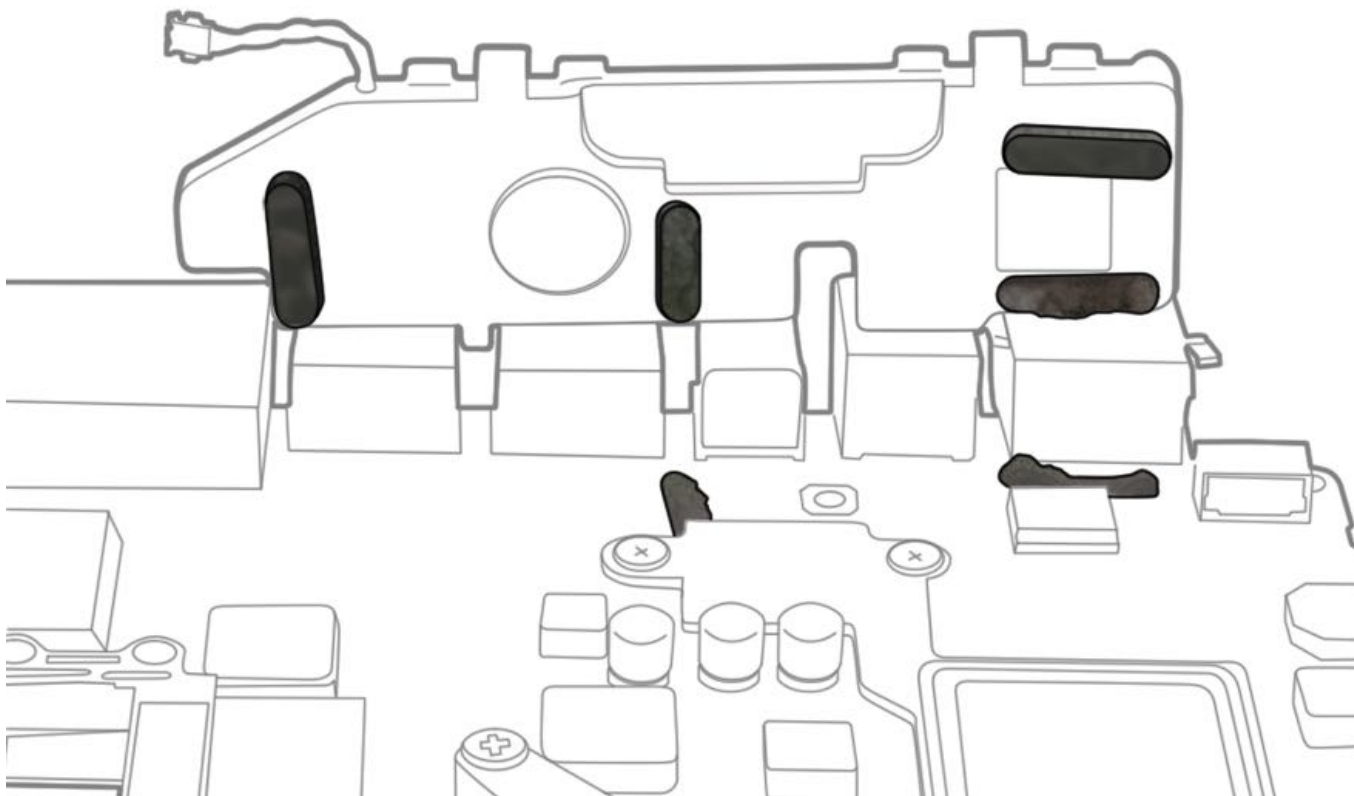


3. Carefully pinch & peel away foam pad remnants on logic board before installing a new replacement speaker.



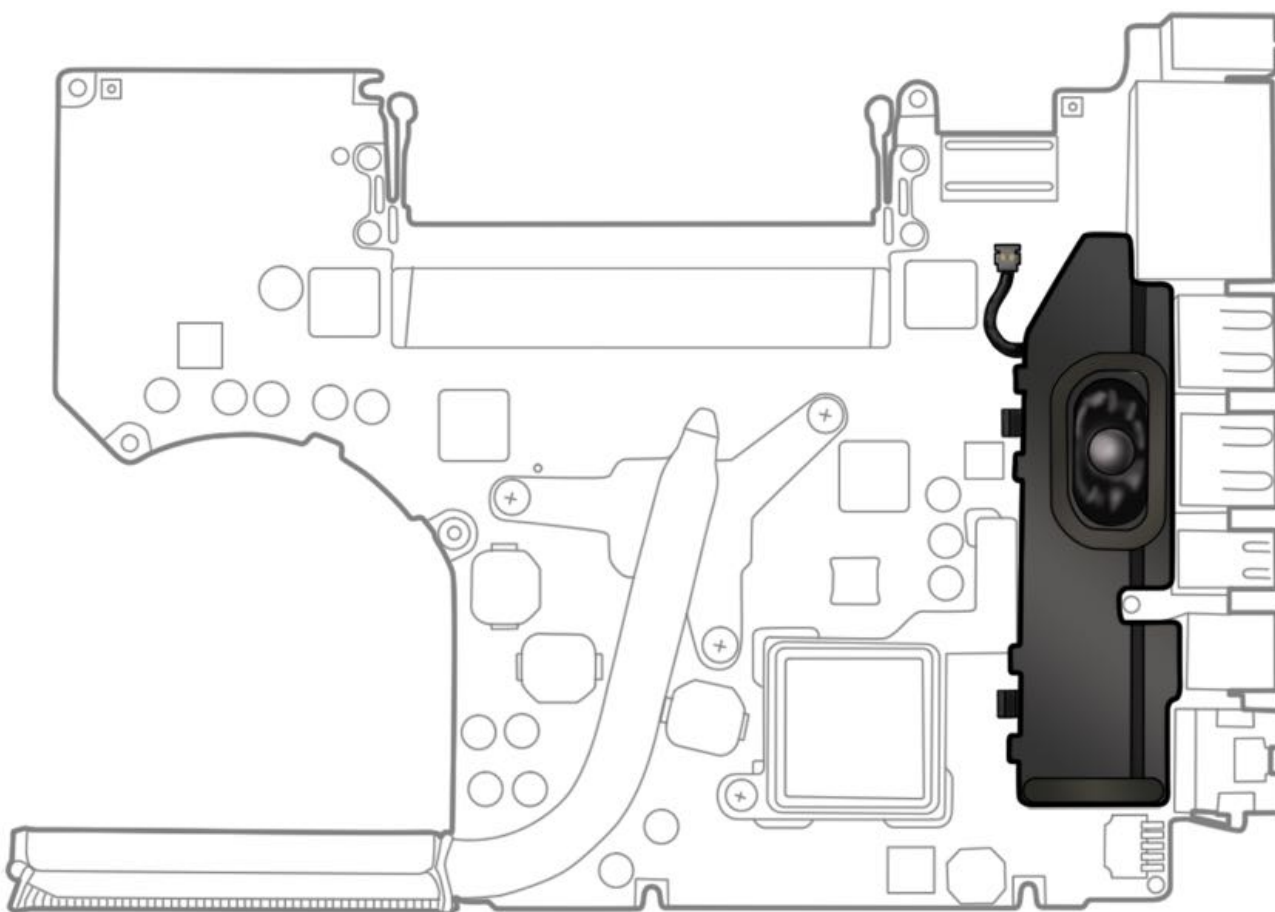
**Caution:** Be very careful not to damage small, delicate components on the logic board when removing speaker and foam pads.





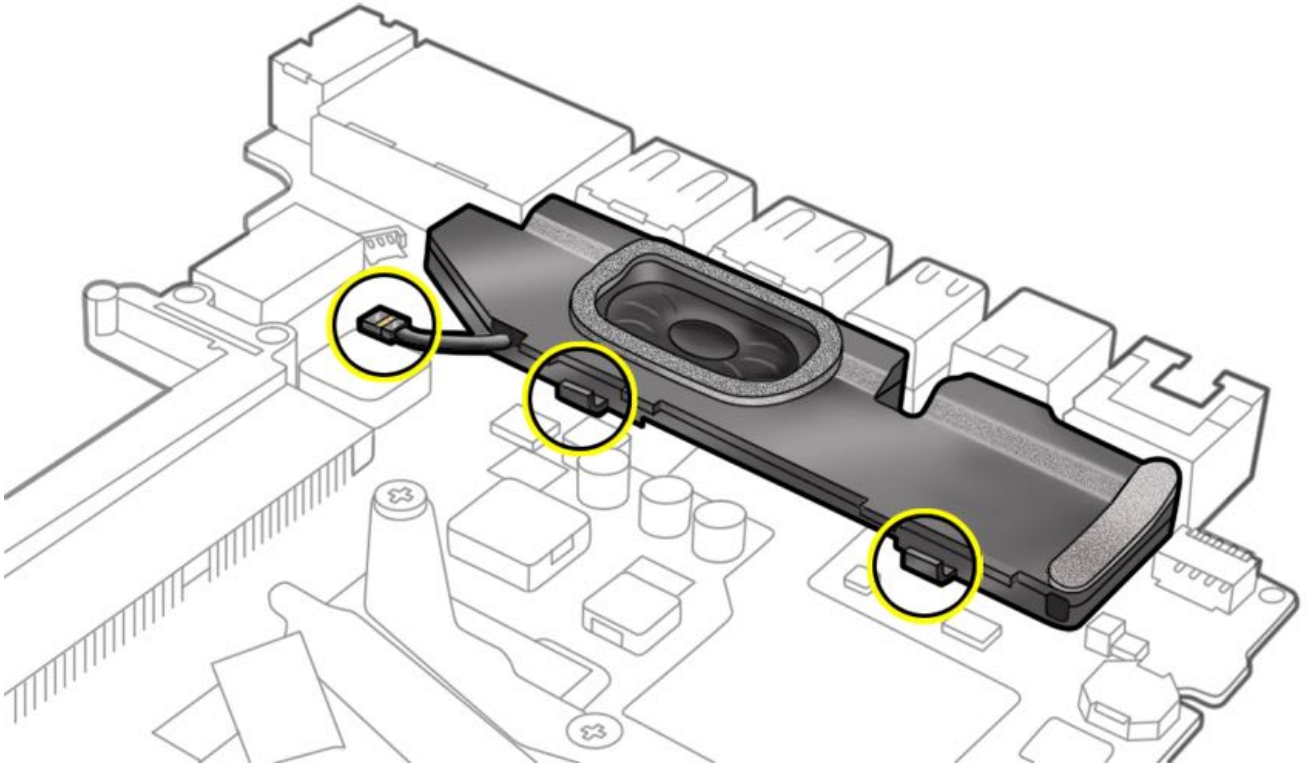
### Steps For Reassembly

1. Make sure left speaker and logic board are free of dust and plastic burrs.
2. If installing a new left speaker, remove paper backing from four foam pads and press speaker into place on back side of logic board.
3. Connect speaker cable to logic board and cover with black tape or Kapton tape.



4. Loop speaker cable through MagSafe cable. MagSafe cable will press down on the speaker cable and shorten the length

if speaker cable isn't looped through.



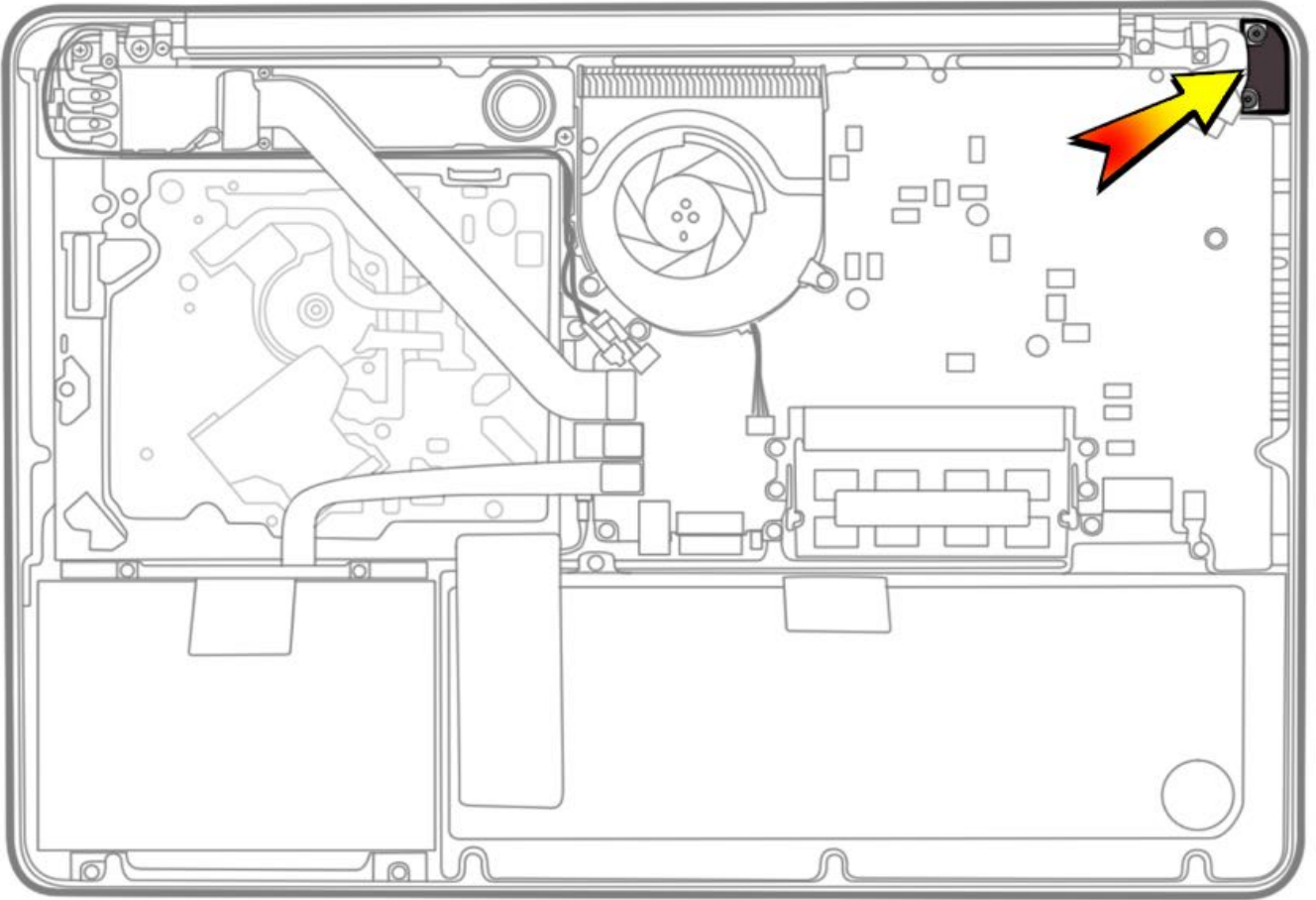


# MacBook Pro (13-inch, Mid 2012): MagSafe Board

## First Steps

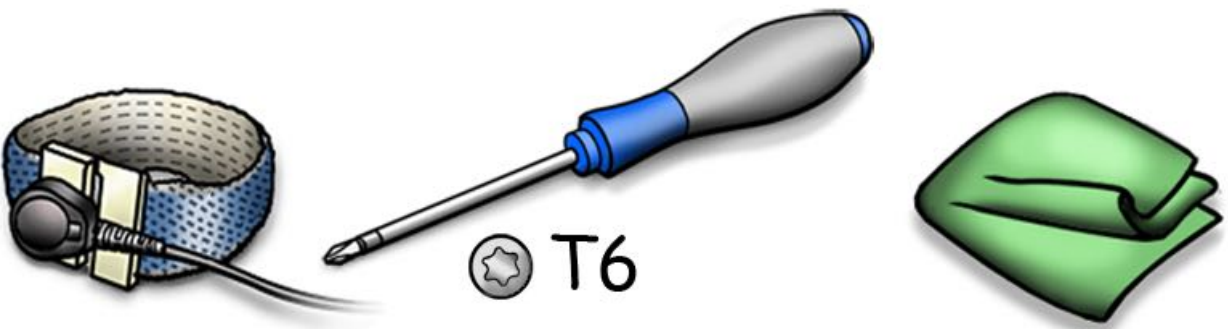
Remove:

- [Bottom Case](#)
- [Memory](#)
- [Fan](#)
- [Logic Board](#)



## Tools

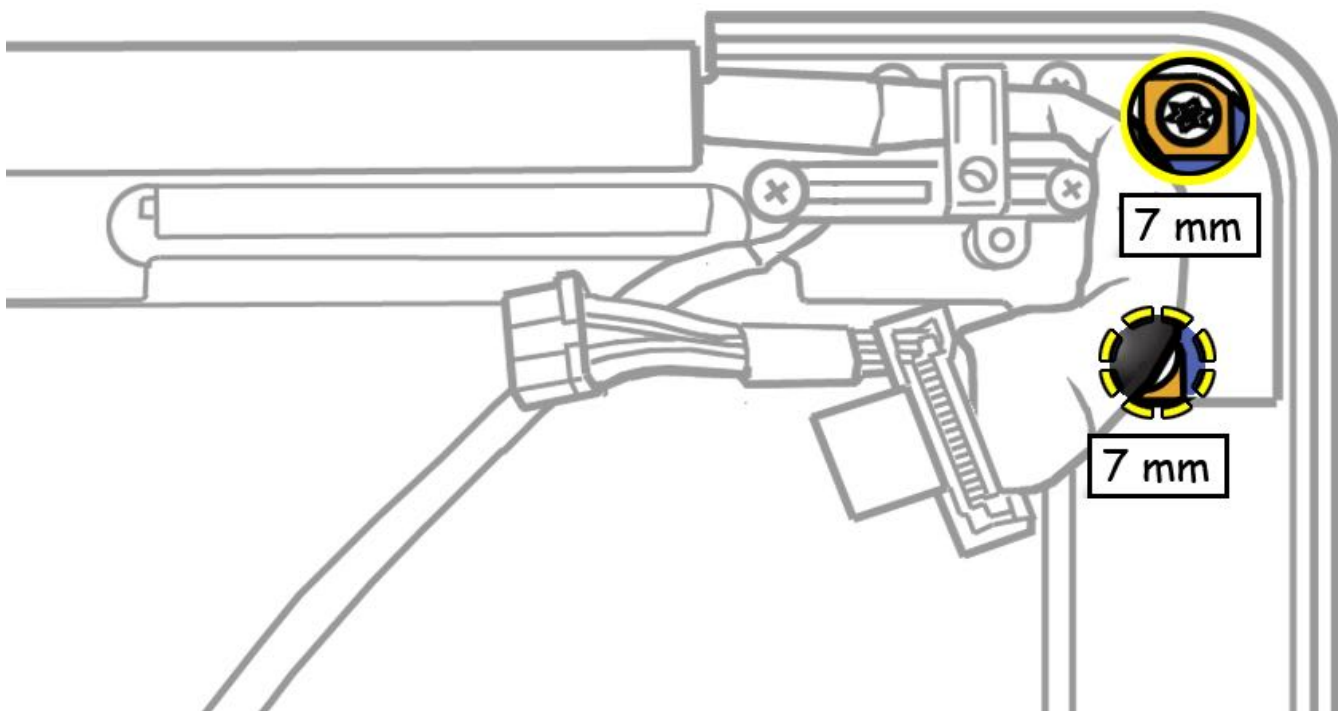
- ESD wrist strap
- Clean, soft, lint-free cloth
- Torx 6 screwdriver, magnetized



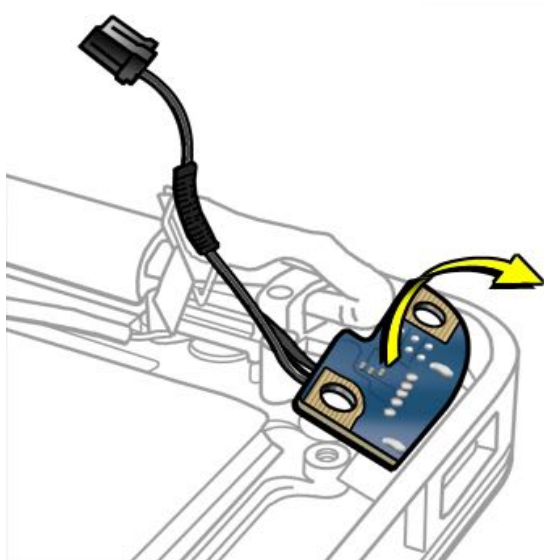
## Steps For Removal

1. Remove screws:

Torx 6  
(2) 922-9455 (7mm)



2. Tilt out MagSafe board and remove from top case.

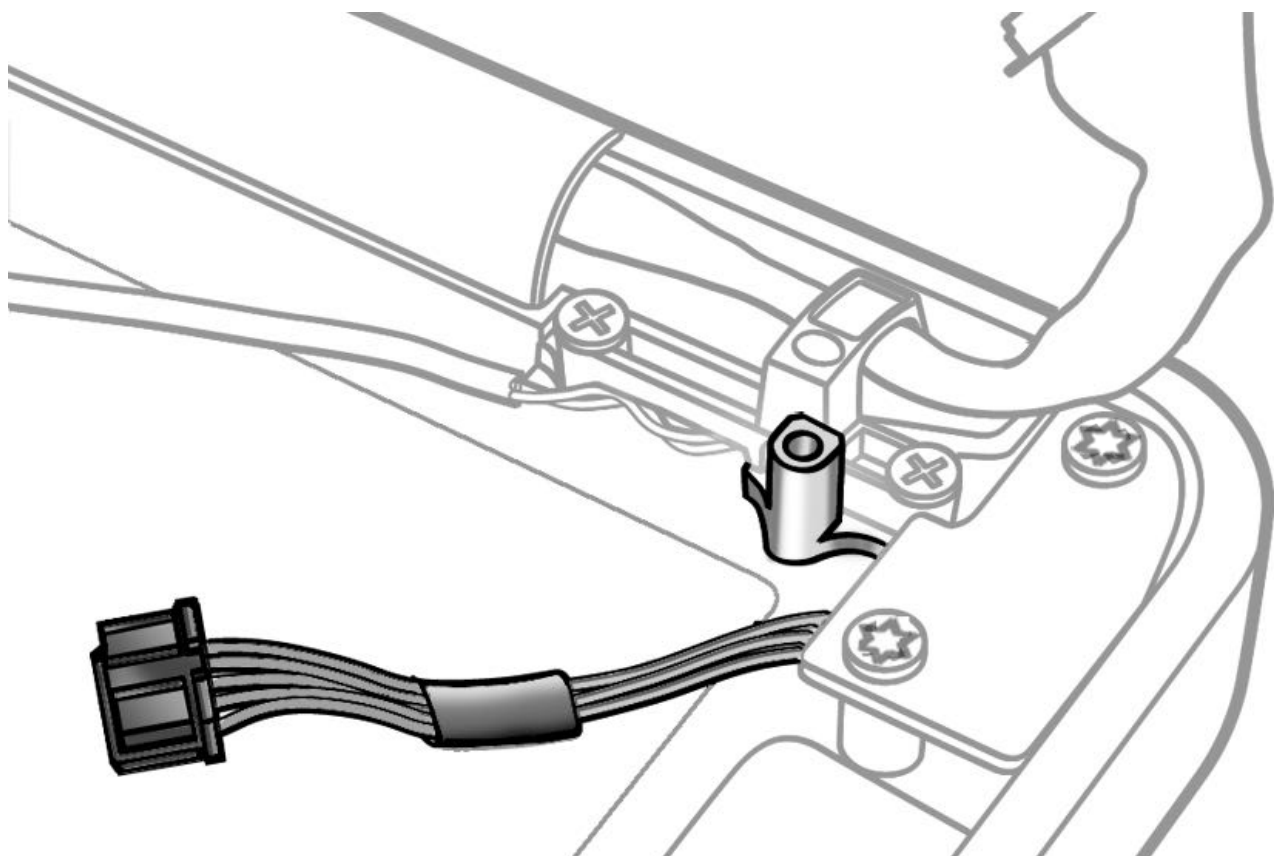


### Steps For Reassembly

**Important:** Connect unplugged external power adapter cable to MagSafe port to make sure port stays completely aligned in top case.

**Note:** Install screws to MagSafe board before installing logic board.

**Note:** Make sure MagSafe cable is routed away from screw standoff, as shown.



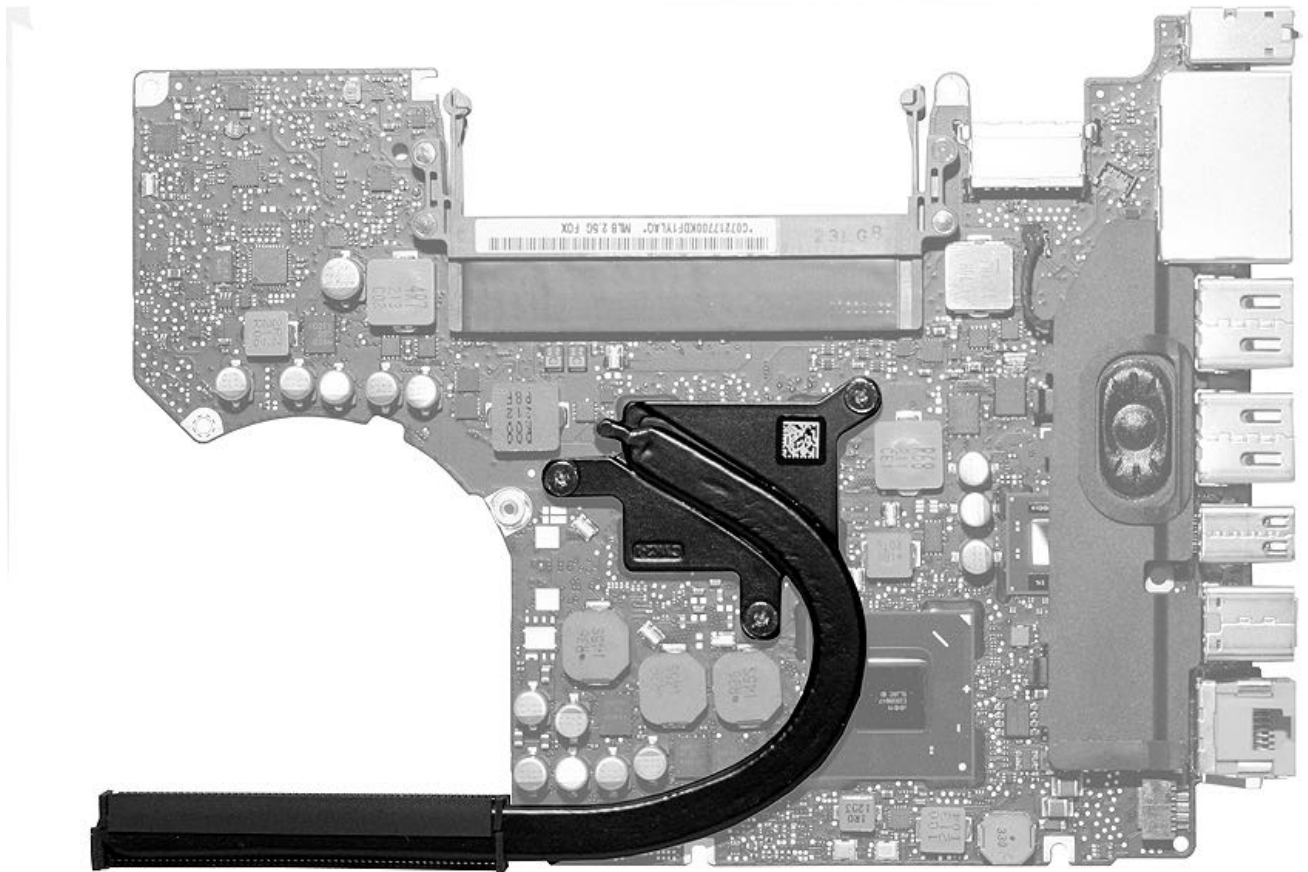
# MacBook Pro (13-inch, Mid 2012): Heat Sink

## First Steps

Remove:

- [Bottom Case](#)
- [Memory](#)
- [Fan](#)
- [Logic Board](#)

**Note:** Heat sink is attached to bottom side of logic board.



## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Phillips #00 screwdriver, magnetized
- Alcohol pads
- Thermal grease syringe (922-7144)
- Black stick



## Steps For Removal

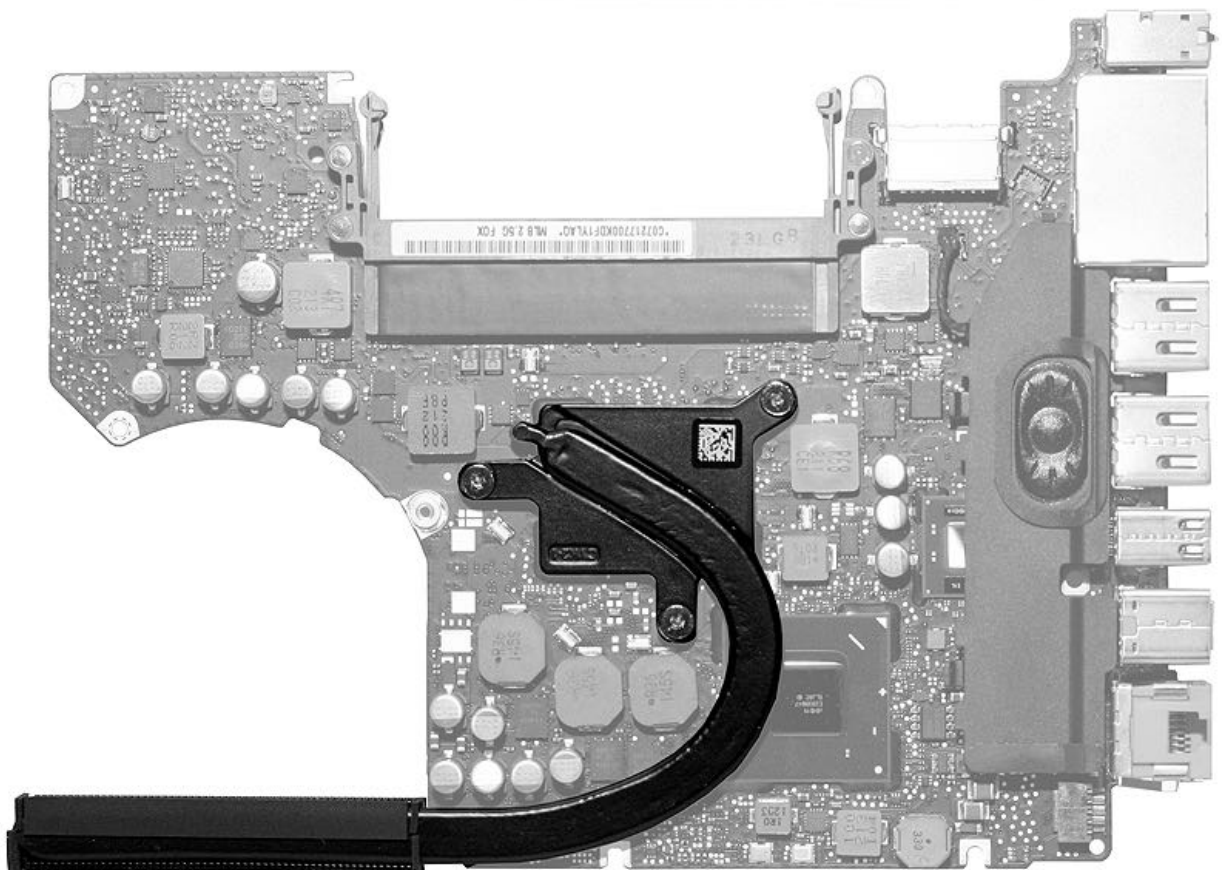


**Caution:** Do not grasp heat sink arm.

1. Remove Phillips #00 screws (with springs):  
(4) 922-8799 (8.5mm)



**Reassembly Note:** Install all screws halfway first; then go back and tighten all screws.



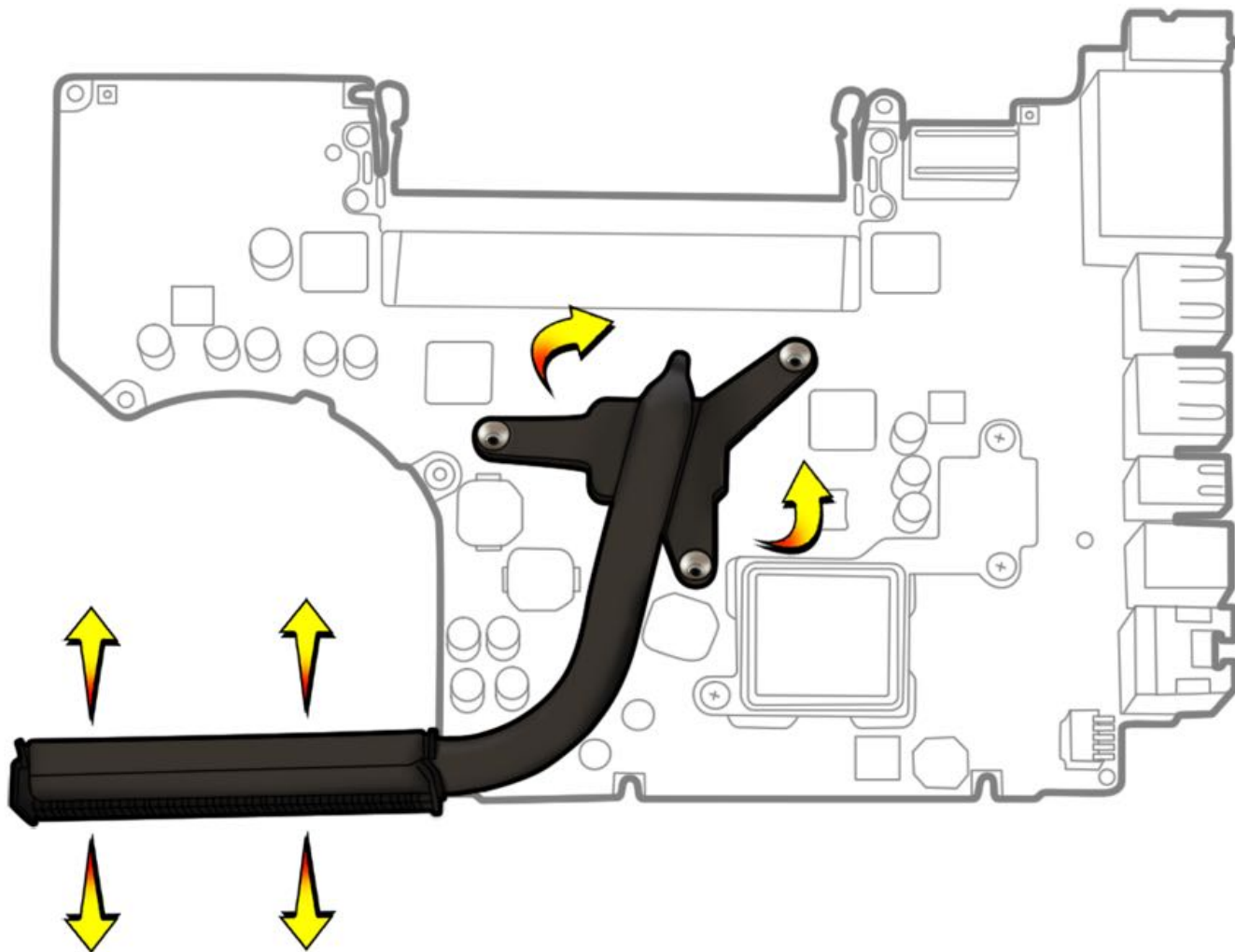


2. Keeping heat sink parallel to logic board, gently wiggle heat sink to loosen adhesive bond to logic board.

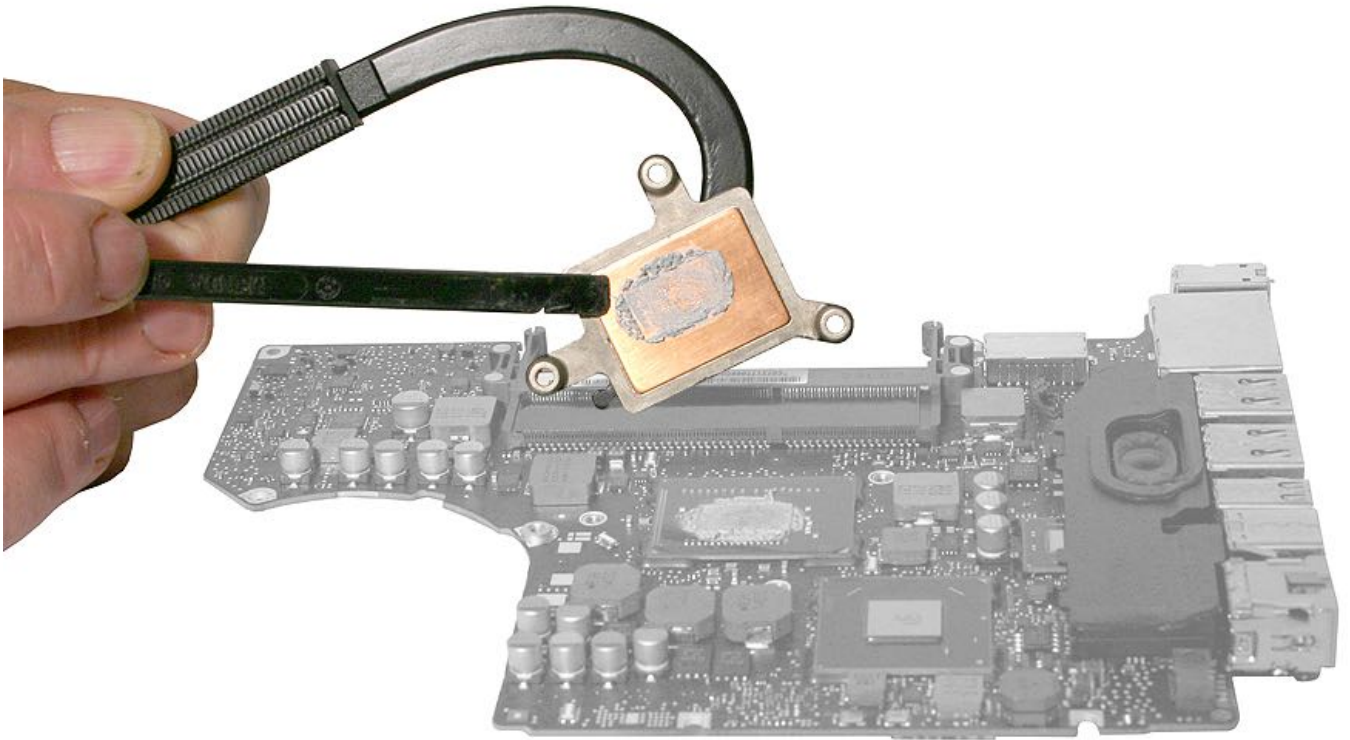


**Caution:** Do not pull heat sink.

3. Keeping heat sink level, lift heat sink away from logic board.



4. Scrape off thermal grease, and use alcohol pad to clean thermal pads and chips.



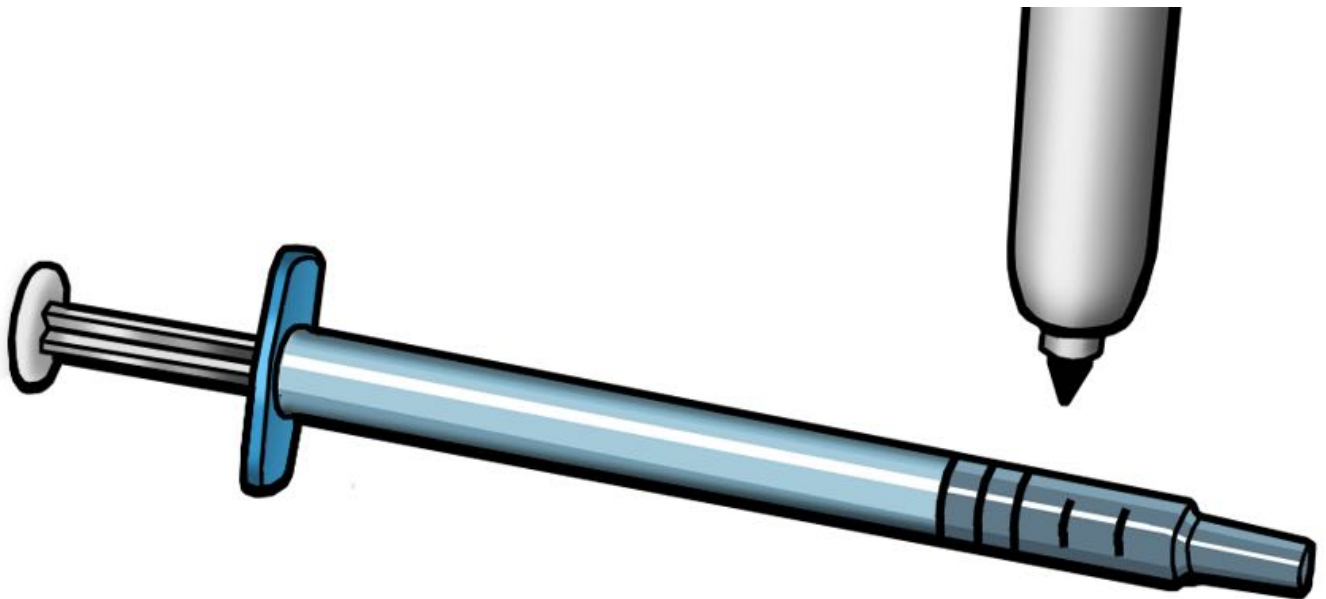
## Steps For Reassembly

**Note:** New heat sinks include pre-applied thermal material. Follow steps 1-2 only if re-installing a heat sink.

1. Use a pen to mark the syringe in thirds.

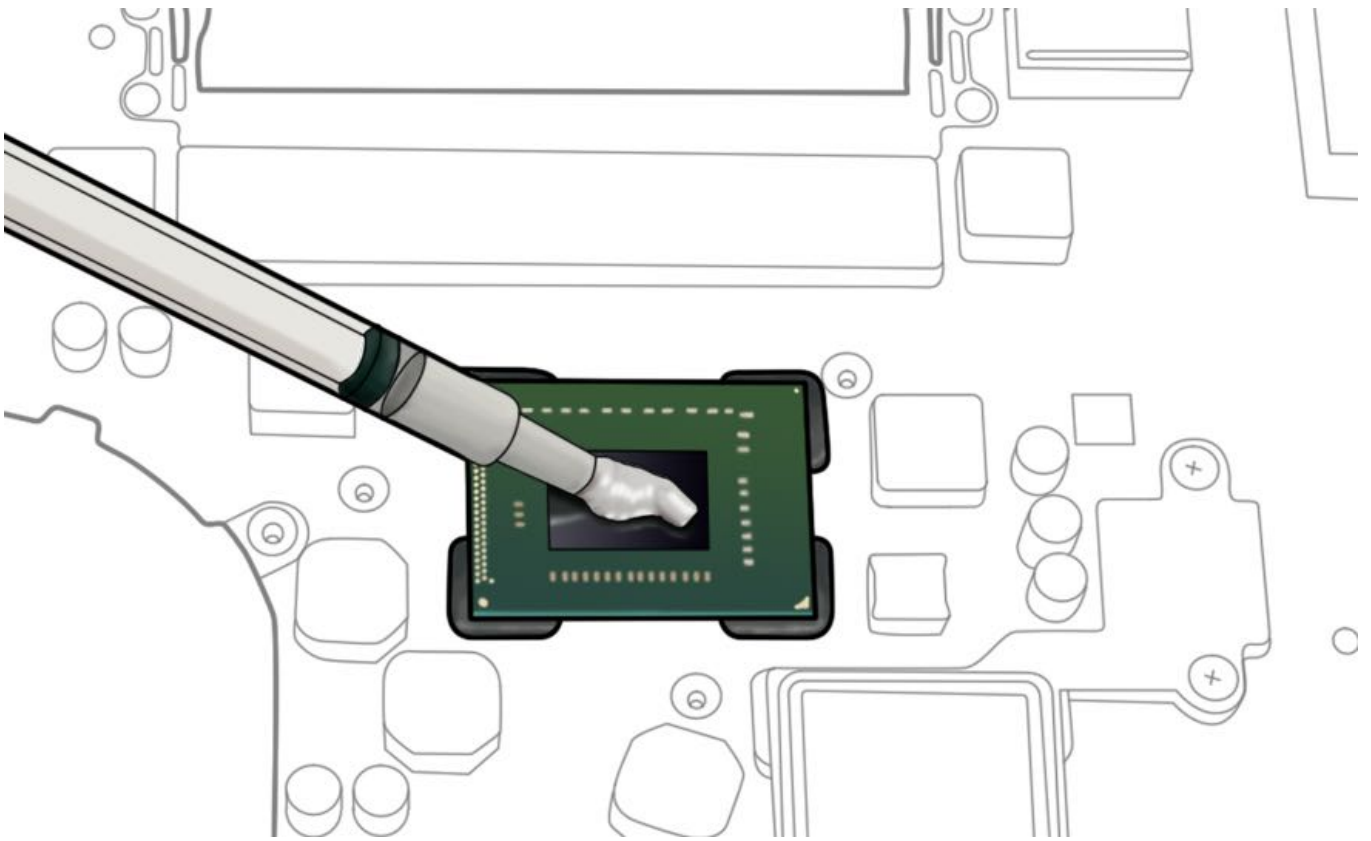


**Caution:** Syringe (922-7144) contains enough thermal material for 3 chips. Because this computer has only 1 chip, use only 1/3 of syringe contents.

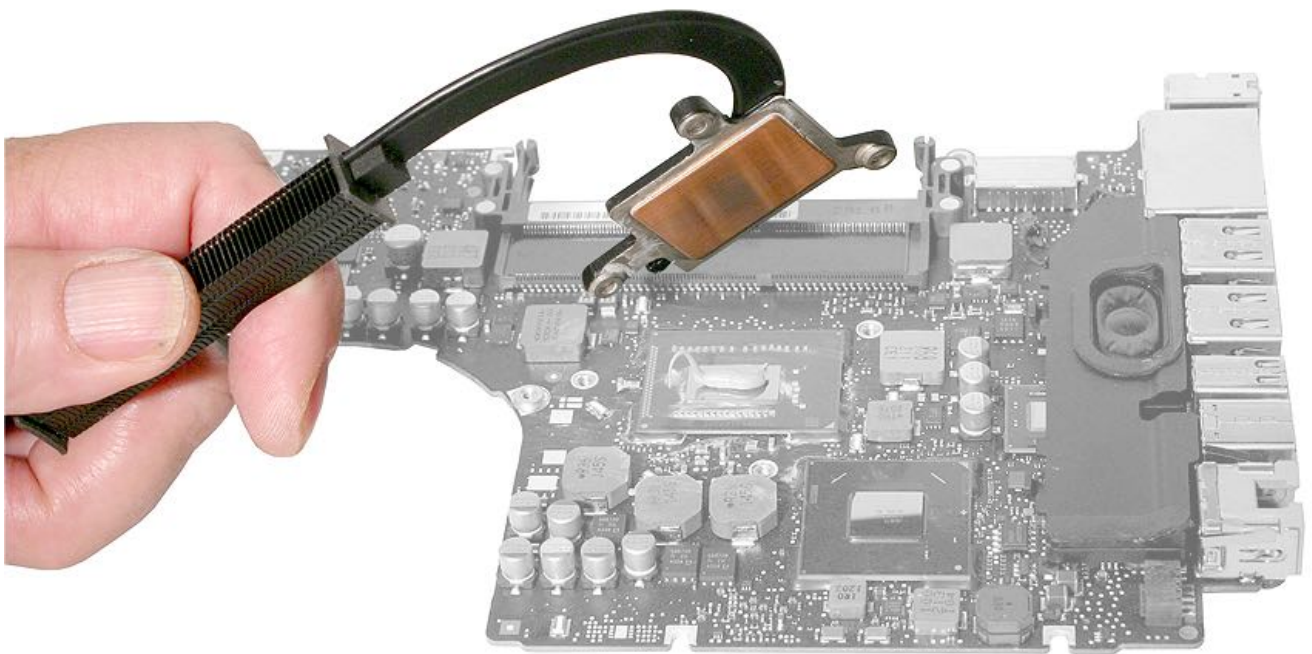


2. Inject 1/3 of grease on chip.





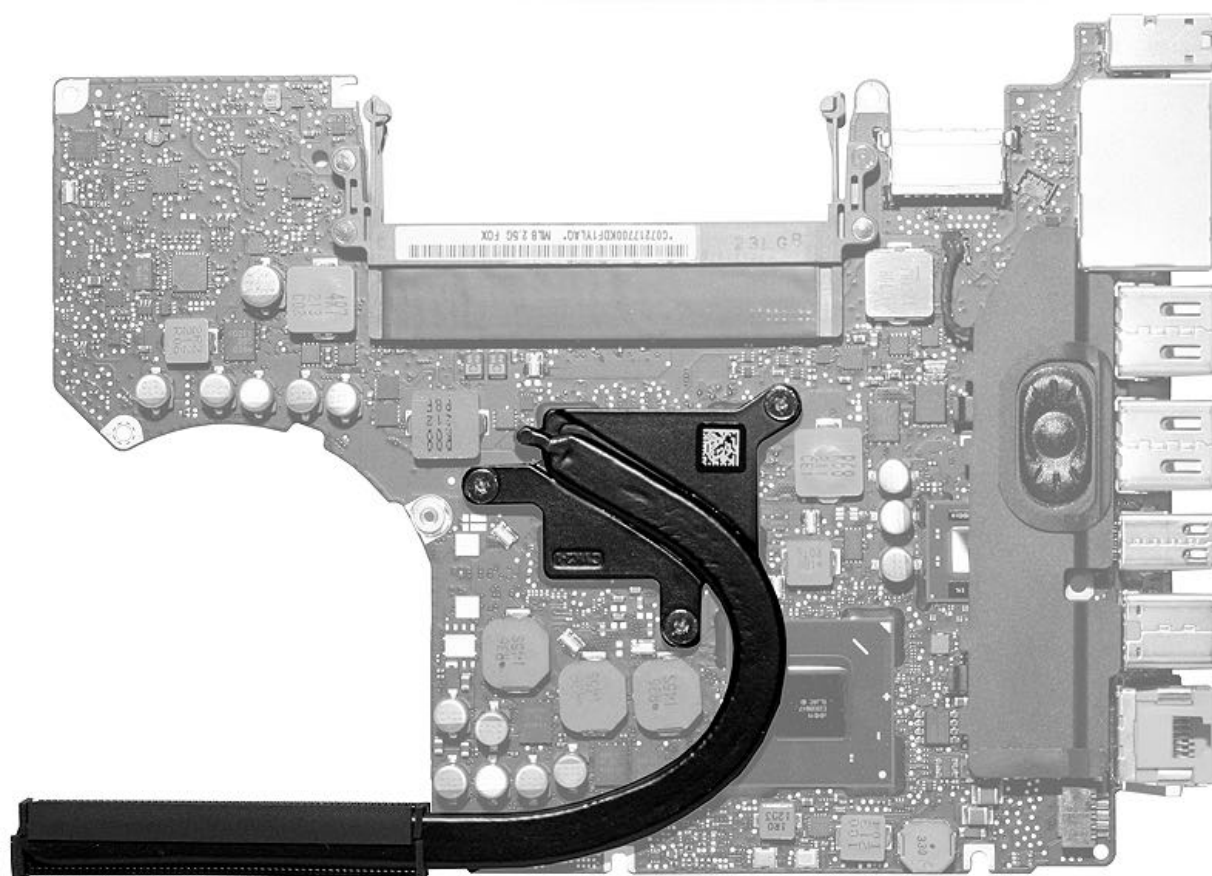
3. Lower heat sink over logic board.



4. Install Phillips #00 screws (with springs):  
(4) 922-8799 (8.5mm)



**Reassembly Note:** Install all screws halfway first; then go back and tighten all screws.



# MacBook Pro (13-inch, Mid 2012): Microphone Cable

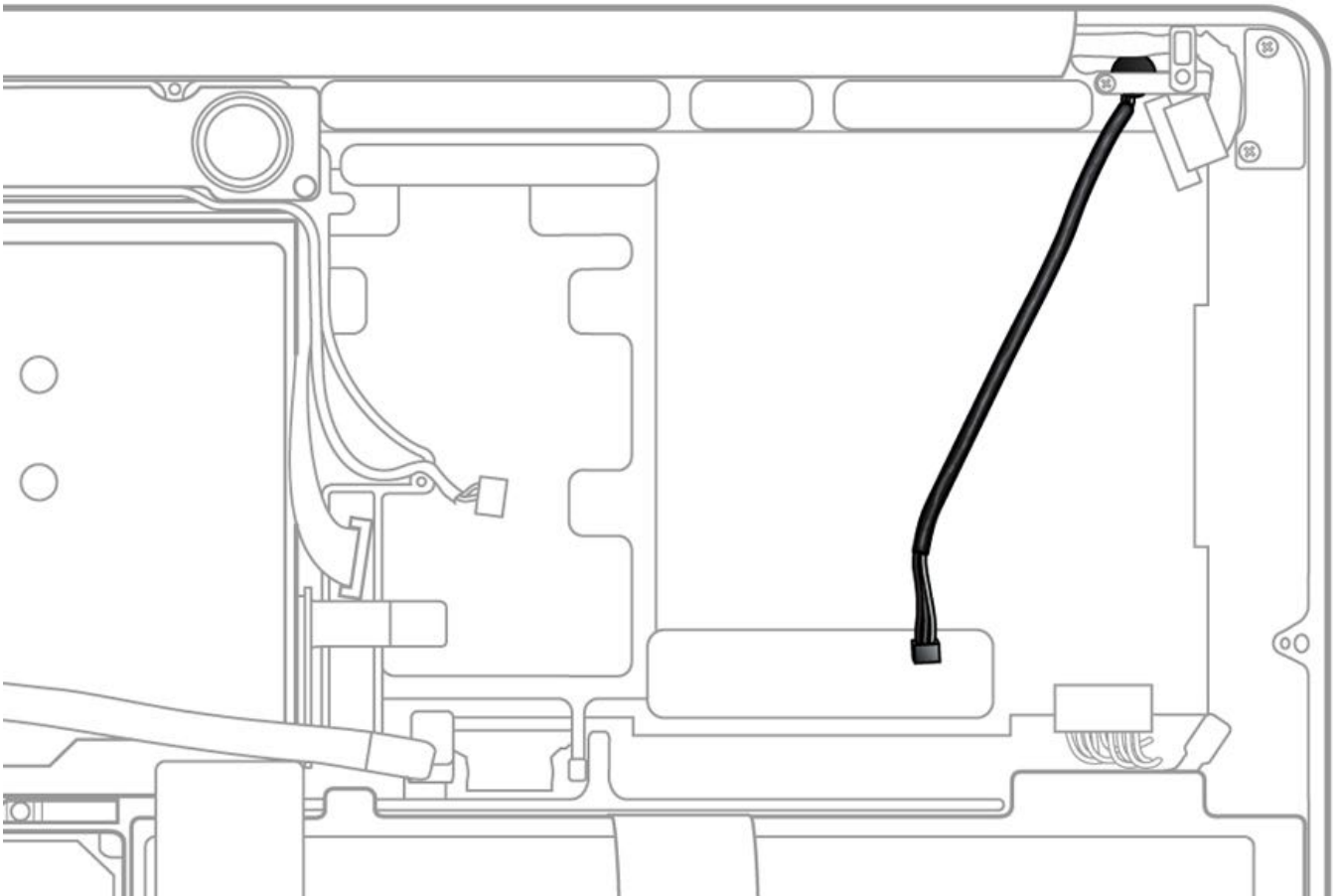
## First Steps

Remove:

- [Bottom Case](#)
- [Memory](#)
- [Fan](#)
- [Logic Board](#)
- [LVDS Cable Guide](#)



**Caution:** Do not strain microphone cable.



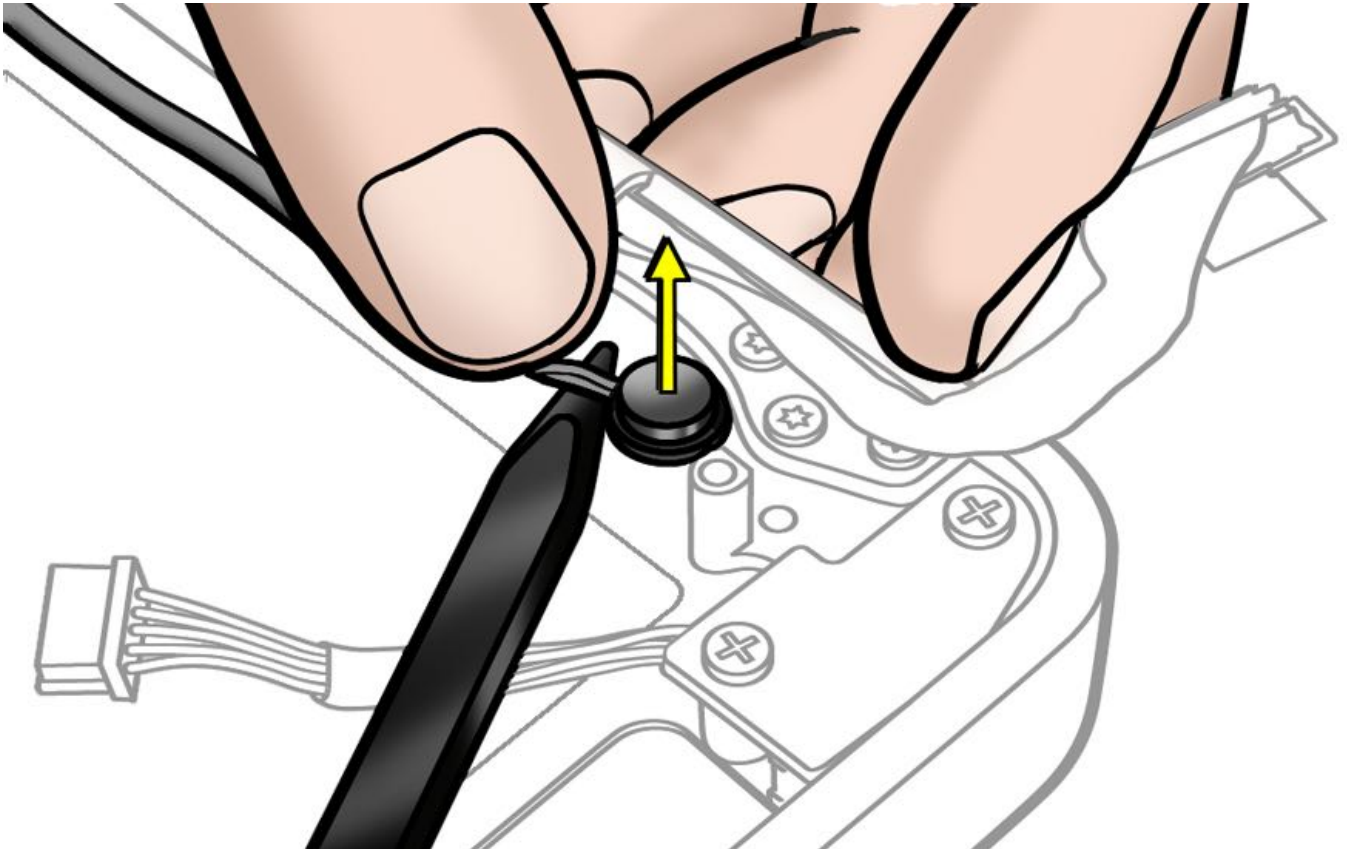
## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Black stick
- Pencil with an eraser



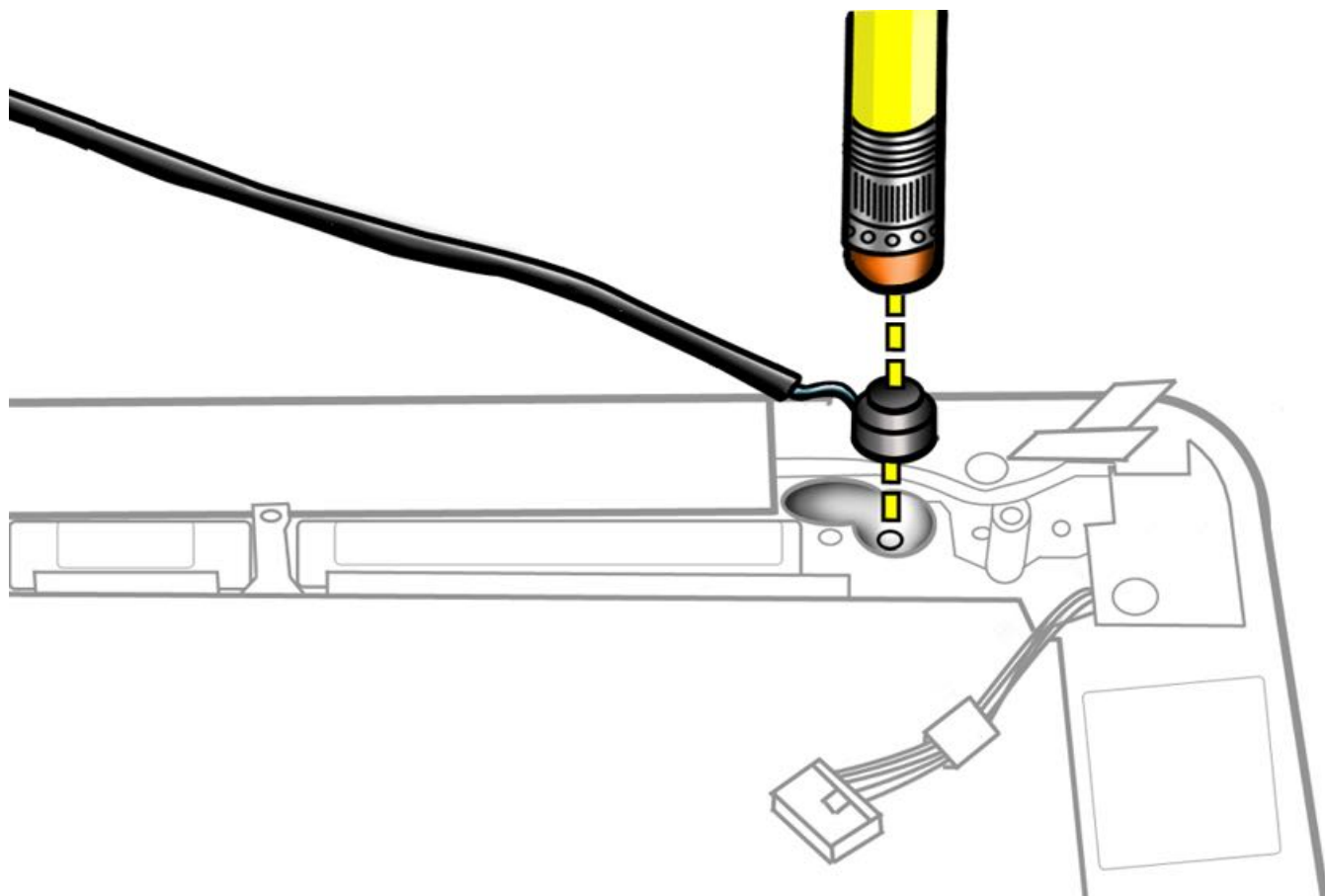
## Steps For Removal

1. Use black stick to pry up microphone gasket.
2. Remove any adhesive remnants from top case.



### Steps For Reassembly

1. Remove paper backing from gasket.
  2. Use a pencil eraser to seat microphone gasket in top case.
- Note:** An improperly seated microphone gasket could result in electronic noise.
3. Make sure microphone cable is not pinched when installing LVDS cable guide.
  4. To route microphone cable, refer to [Logic Board](#) section.

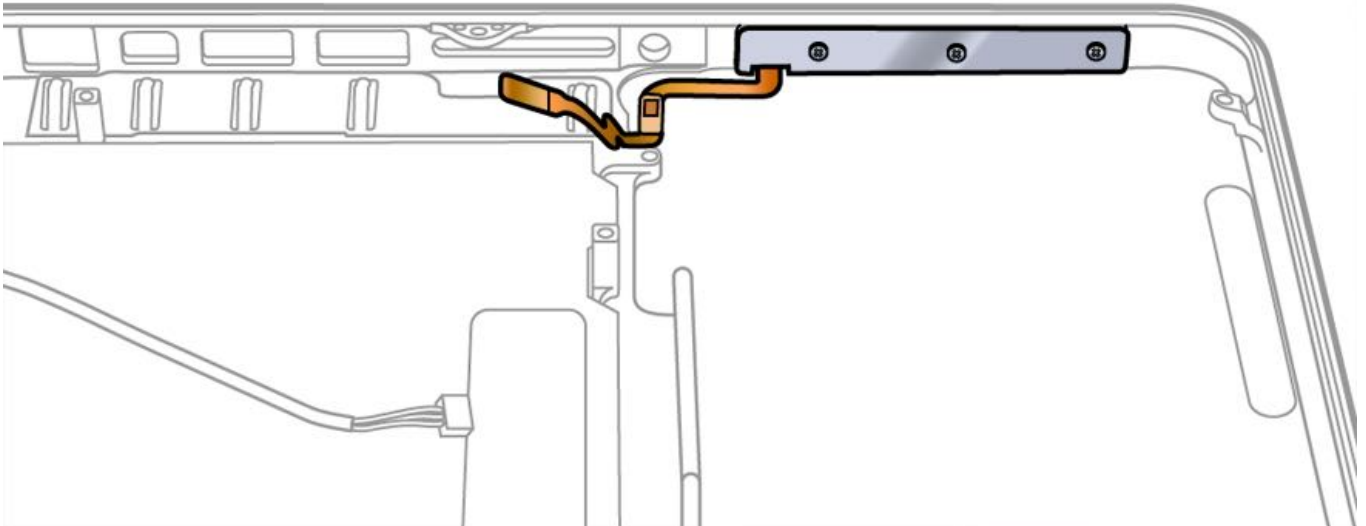


# MacBook Pro (13-inch, Mid 2012): Sleep Sensor / Battery Indicator Light (BIL)

## First Steps

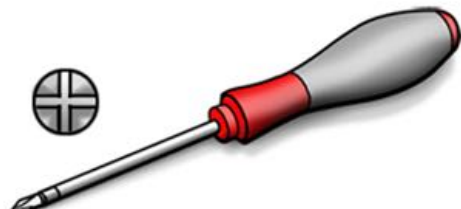
Remove:

- [Bottom Case](#)
- [Battery](#)
- [Memory](#)
- [Hard Drive](#)
- [Fan](#)
- [Logic Board](#)



## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Phillips #00 screwdriver, magnetized
- Piece of tape



## Steps For Removal

1. Place tape over BIL button on outside of top case, to prevent it from falling out.



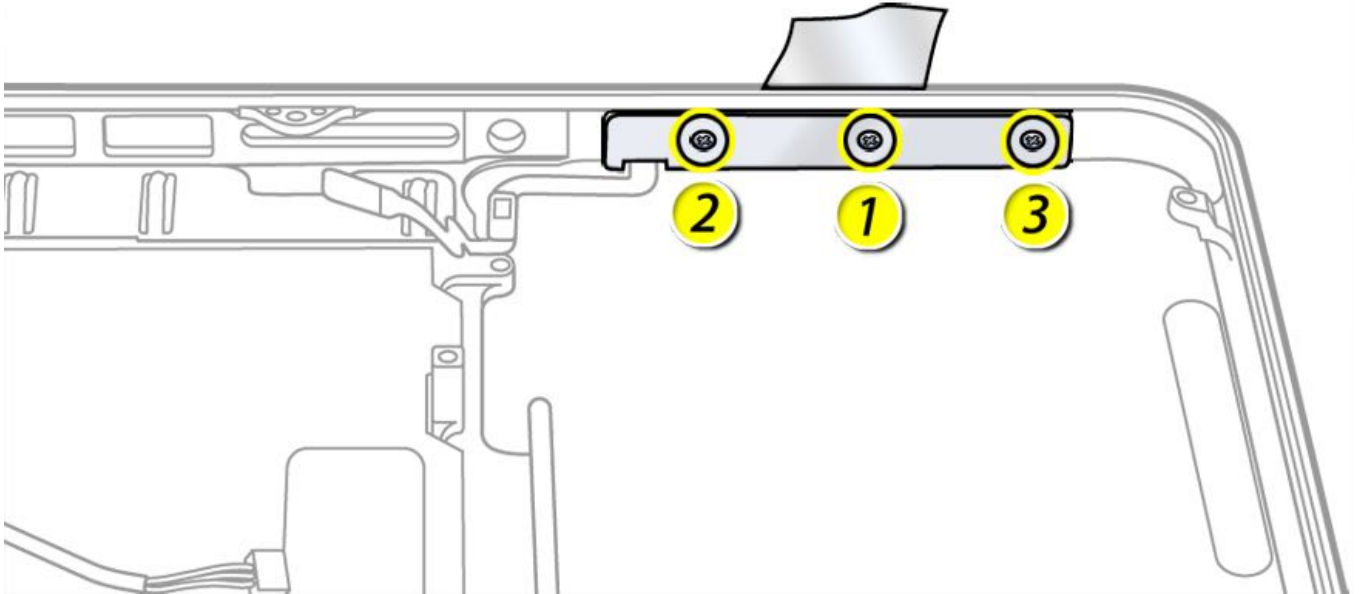
2. Remove Phillips #00 screws:

- (3) 922-9069 (2mm)

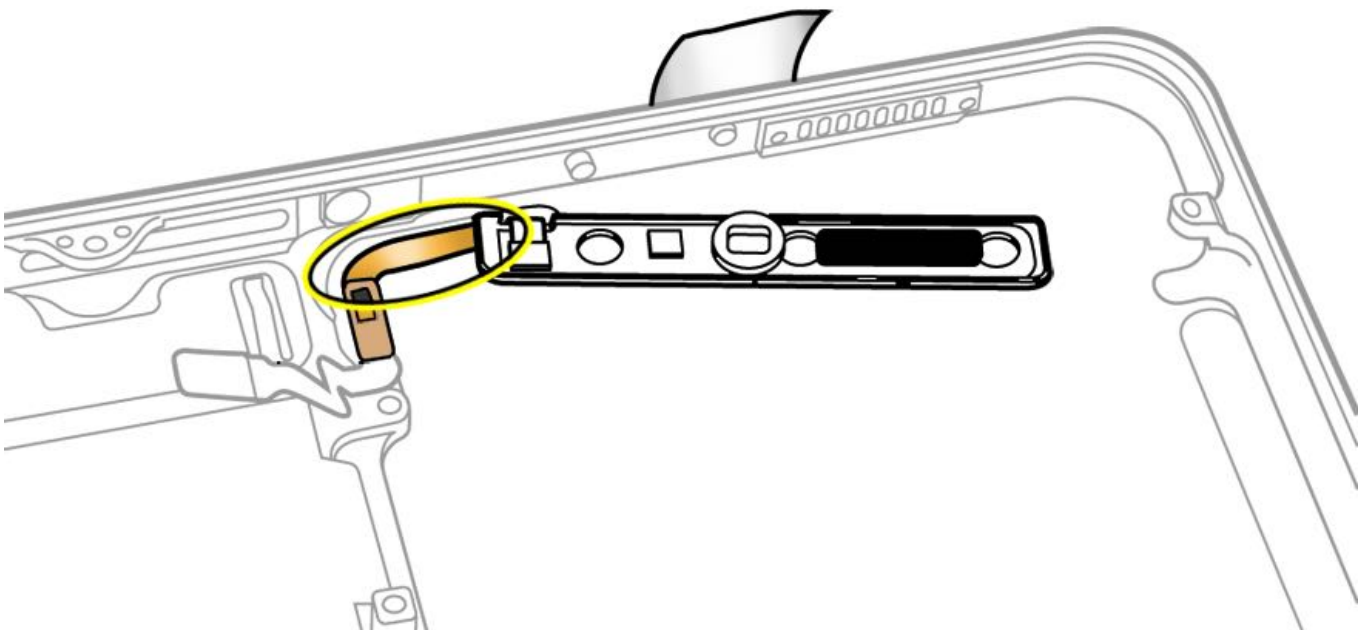




**Replacement Note:** Install screws in order shown.



3. Peel up cable adhesive and remove BIL board from top case.

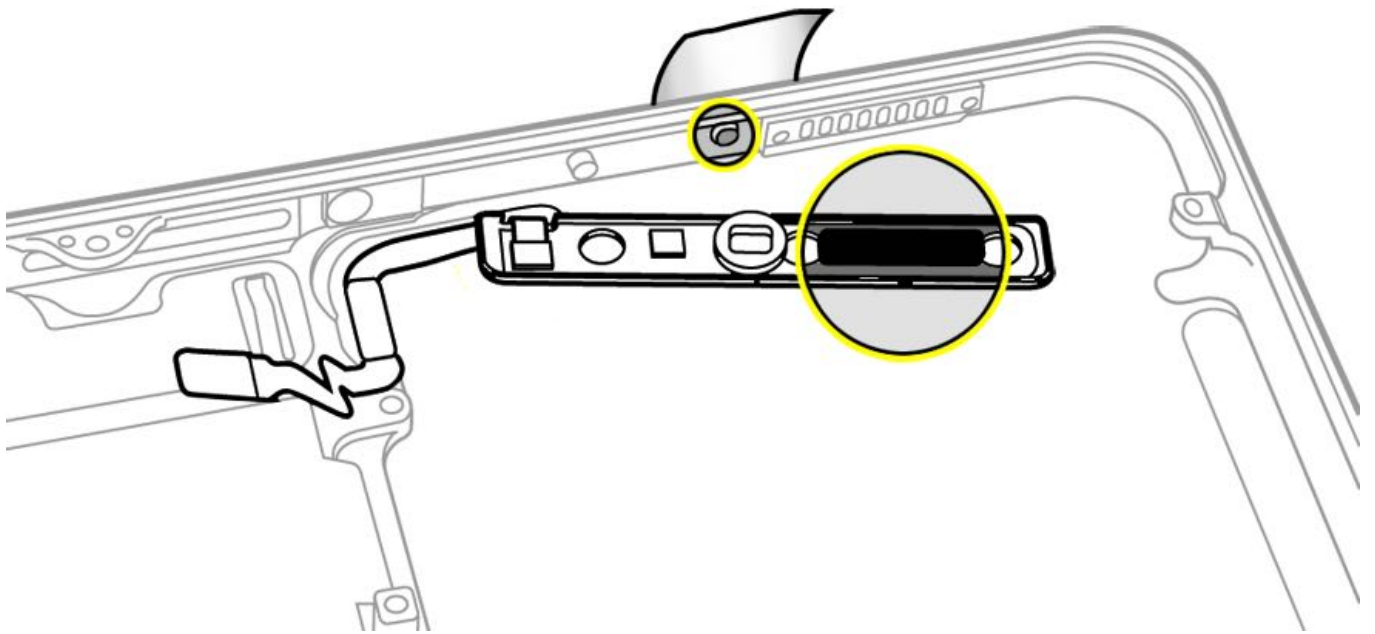


## Steps For Reassembly

**Reassembly Note:** Before replacing the BIL board, check that:

- long rubber gasket is assembled on top of the LED row
- BIL button is installed in the top case



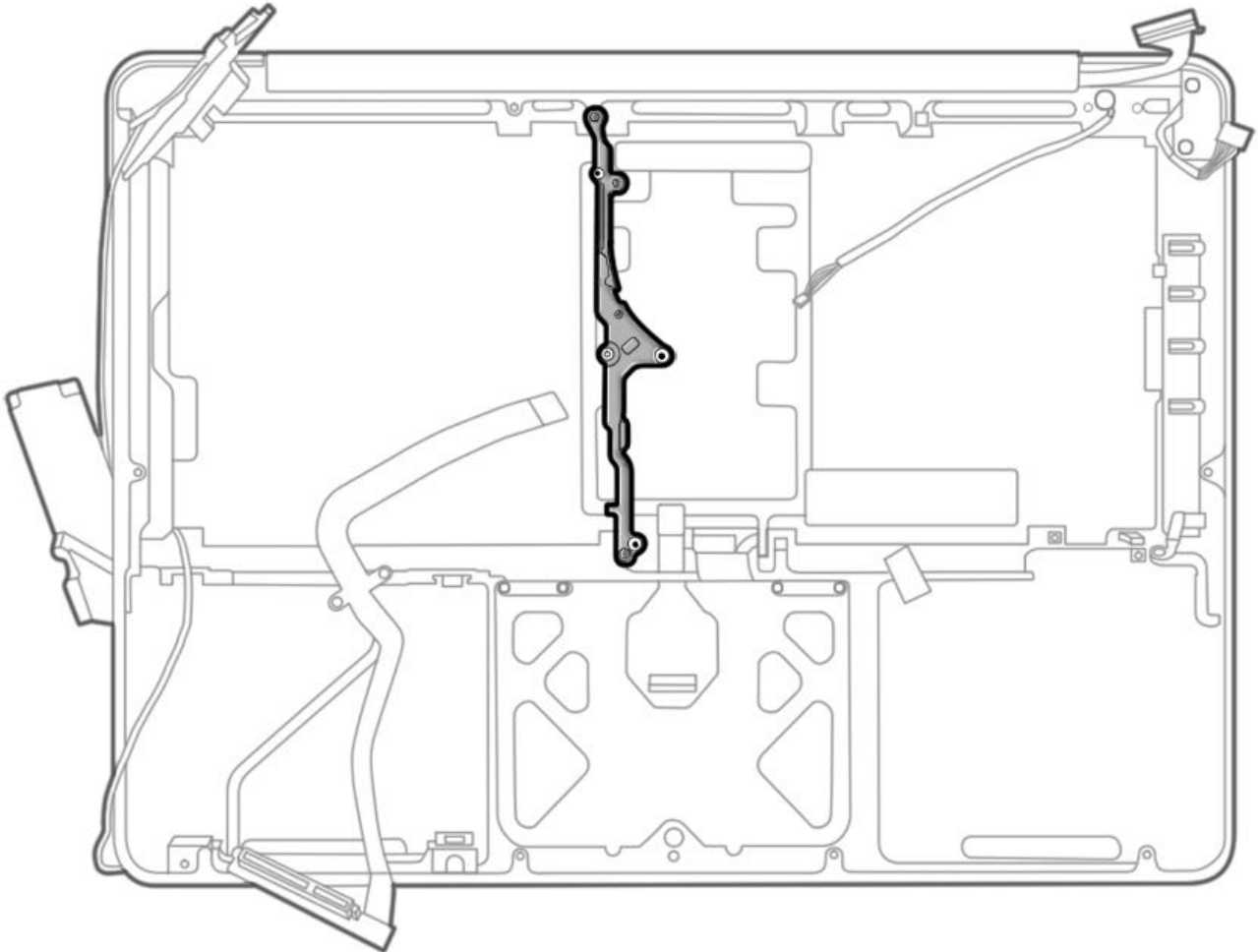


# MacBook Pro (13-inch, Mid 2012): Center Bracket

## First Steps

Remove:

- [Bottom Case](#)
- [Memory](#)
- [Optical Drive](#)
- [Right Speaker](#)
- [Fan](#)
- [Logic Board](#)



## Tools

- ESD wrist strap
- Clean, soft, lint-free cloth
- Phillips #00 screwdriver, magnetic



## Steps For Removal

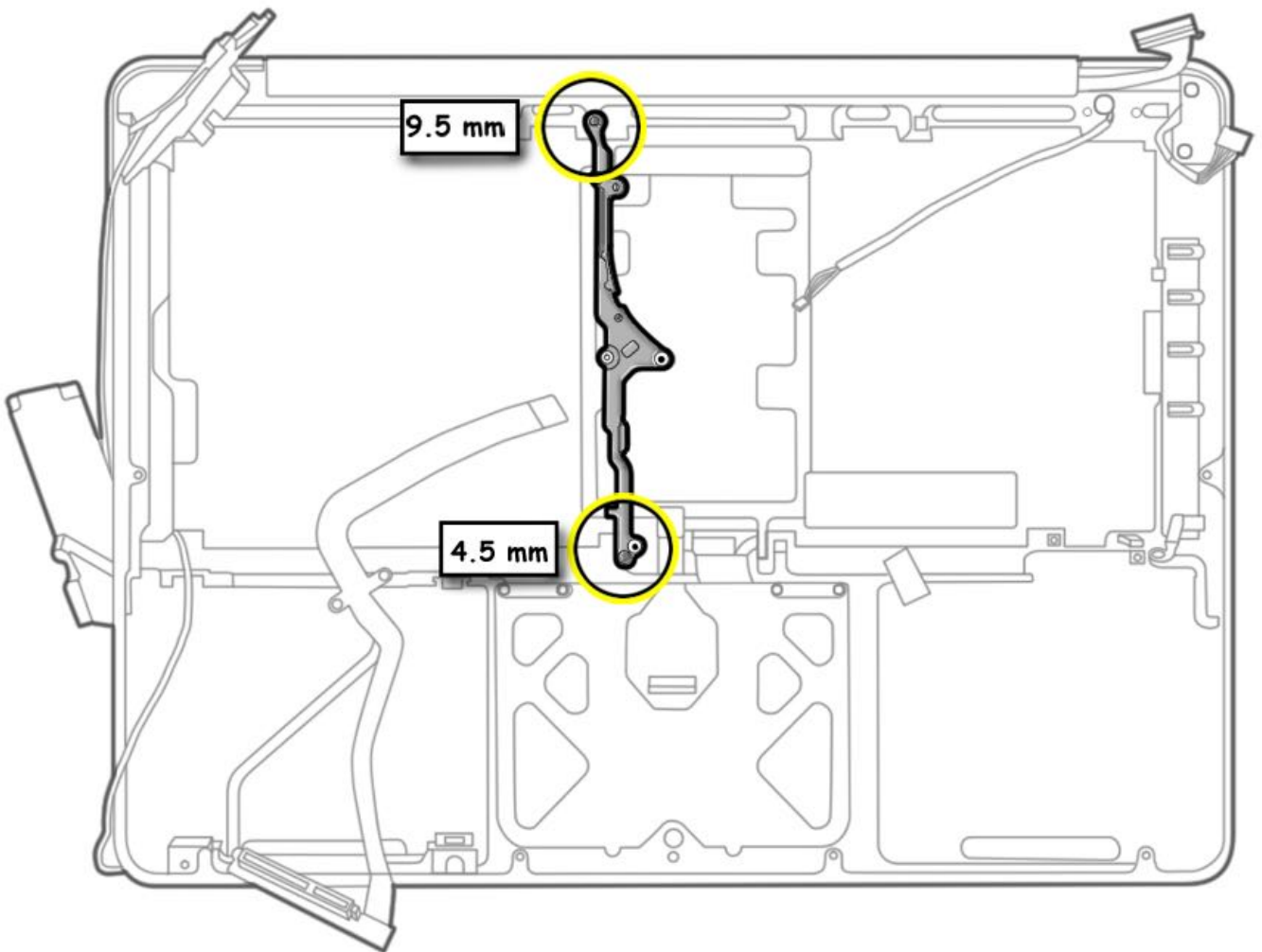
1. Remove Phillips #00 screws:  
(1) 922-8648 (9.5mm)



(1) 922-8744 (4.5mm)



2. Remove center bracket from top case.



### Steps For Reassembly

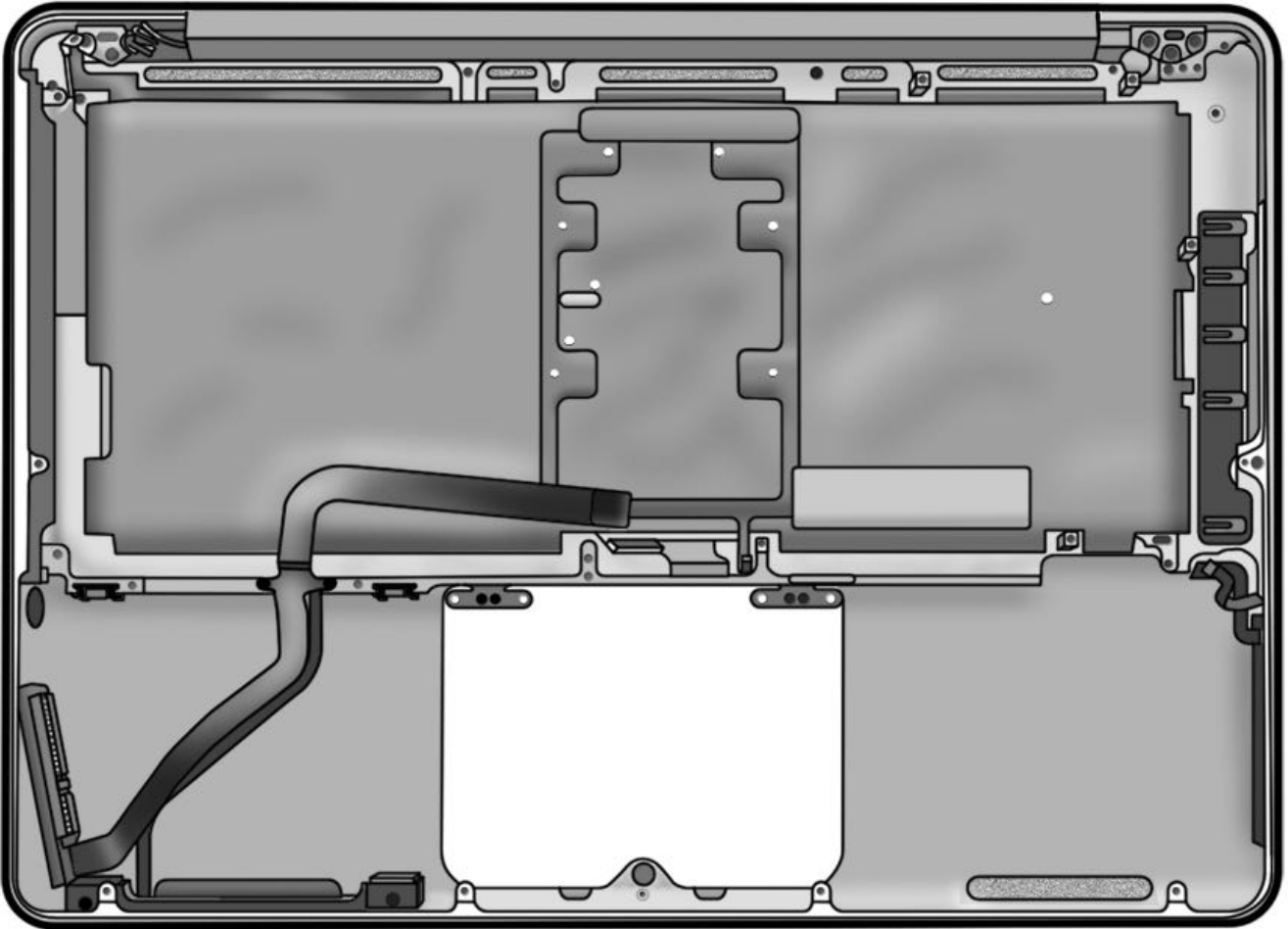
Reassemble in reverse order of removal steps.

# MacBook Pro (13-inch, Mid 2012): Top Case

## First Steps

Remove:

- [Bottom Case](#)
- [Battery](#)
- [Memory](#)
- [Rear Hard Drive Bracket](#)
- [Hard Drive](#)
- [AirPort/Bluetooth Flex Cable](#)
- [AirPort/Bluetooth Card with Holder](#)
- [Optical Drive](#)
- [Right Speaker/Subwoofer](#)
- [LVDS Cable Guide](#)
- [Display Clamshell](#)
- [Fan](#)
- [Logic Board](#)
- [MagSafe Board](#)
- [Microphone Cable](#)
- [Center Bracket](#)
- [Trackpad](#)



## Tools

No tools are required for this procedure.

## Steps For Removal

With the first steps completed, top case is the remaining part.

**Note:** A replacement top case includes the following parts, which are also available separately:

- [front hard drive bracket](#) with IR/sleep/HD cable

- [sleep sensor/battery indicator light \(BIL\)](#)

## Steps For Reassembly

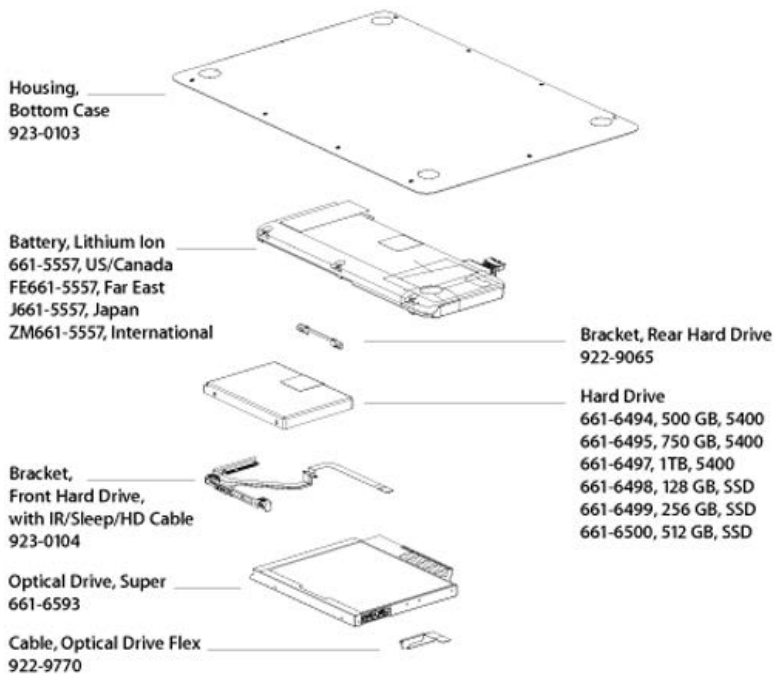
**Replacement Note:** Before assembling computer, be sure to first transfer the following parts from old top case to replacement top case:

- [trackpad](#)
- [center bracket](#)
- [microphone cable](#)
- [MagSafe board](#)
- [right speaker / subwoofer](#)

# MacBook Pro (13-inch, Mid 2012): Exploded Views

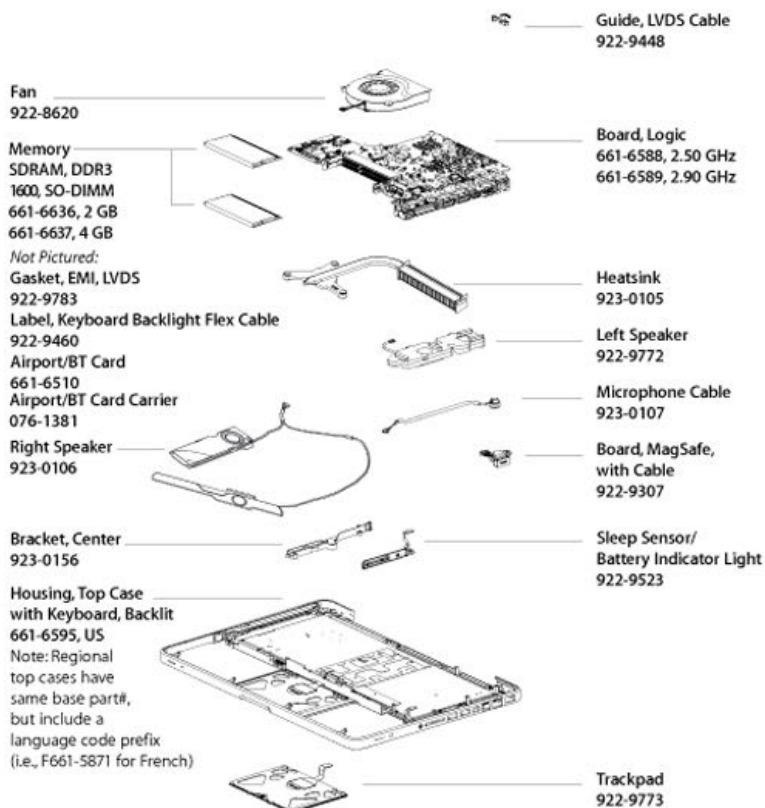
## Main Assembly #1

MacBook Pro (13-inch, Mid 2012)



## Main Assembly # 2

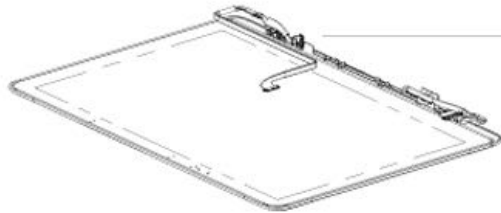
MacBook Pro (13-inch, Late 2011)



## Display Assembly

MacBook Pro (13-inch, Mid 2012)
















Clutch Cover, Display  
923-0153



Display Clamshell,  
Glossy  
661-6594



## MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Screw Chart

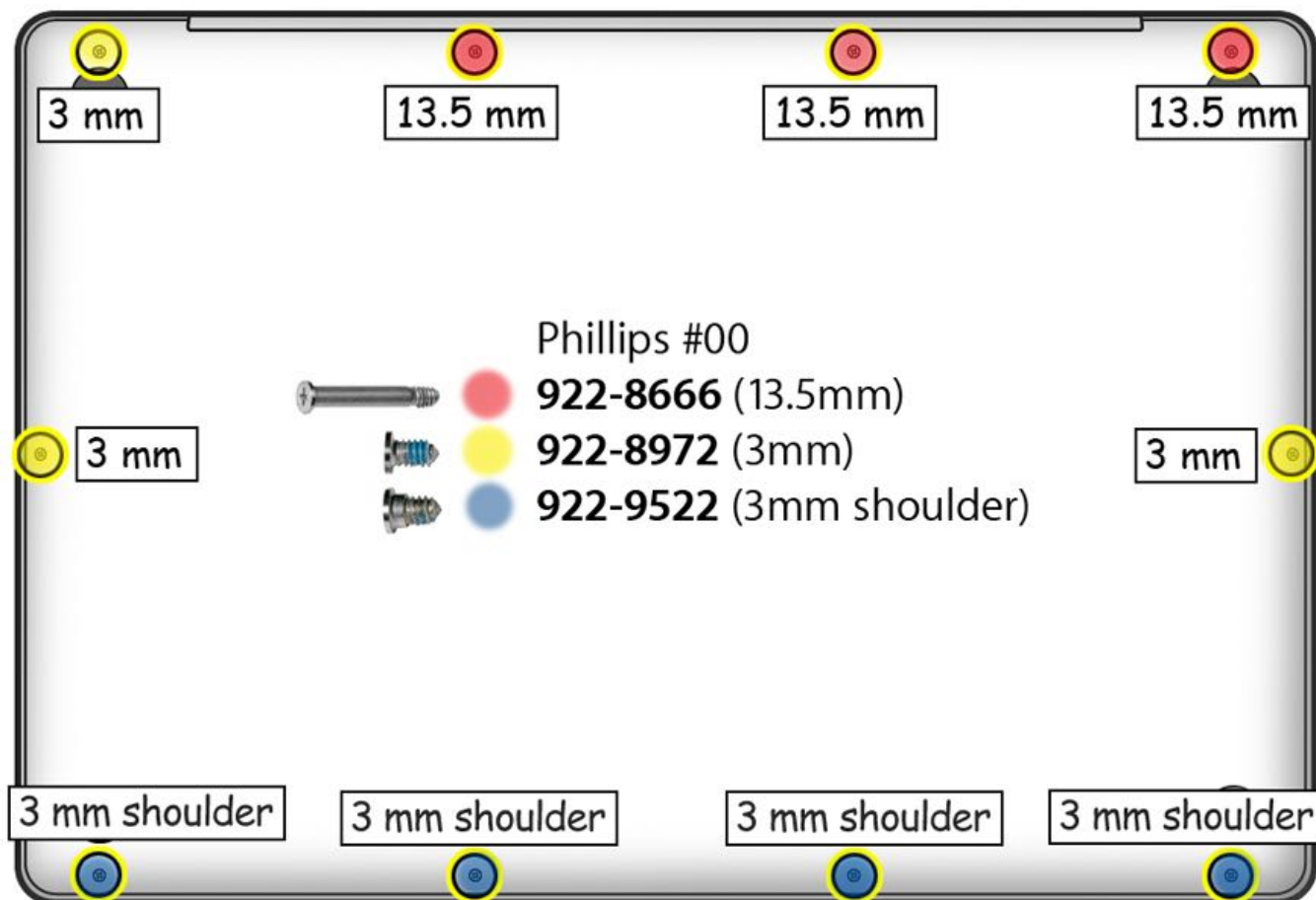
<b>076-1379</b> Torx 6  Included in Logic Board Kit	<b>922-9452</b> Torx 6  MLB to center bracket (front)	<b>922-8799</b> Phillips #0  Heat sink with springs (3)
<b>922-9036</b> Phillips #00  Front flex to top case	<b>922-9777</b> Phillips #00  AP/BT Carrier to Top Case	<b>922-8648</b> Phillips #00  Center bracket (top), Right Speaker to Center Bracket
<b>922-9453</b> Torx 6  MLB to top case (front)	<b>922-8744</b> Phillips #00  Center bracket to top case	<b>922-9105</b> Phillips #00  HDD bracket front to top case
<b>922-9454</b> Torx 6  Fan to MLB	<b>922-9455</b> Torx 6  Fan to center bracket, Magsafe	<b>922-8662</b> Phillips #00  Bracket to ODD ODD to TOP Case
<b>922-9226</b> Tri-Lobe  Battery cover to top case	<b>922-9227</b> Tri-Lobe  Battery cover to top case	<b>922-9458</b> Phillips #00  LVDS cable guide to top case (right)

<b>922-8658</b> Phillips #00  LVDS cable guide to top case (left)	<b>922-8972</b> Phillips #00  Bottom case to top case (3)	<b>922-9522</b> Phillips #00  Bottom case to top case (4)
<b>922-9451</b> Torx 8  Display assembly hinges	<b>922-9778</b> Phillips #00  Speaker, AP/BT Carrier	<b>922-8666</b> Phillips #00  Bottom case to top case (3)

# MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Screw Location Diagrams

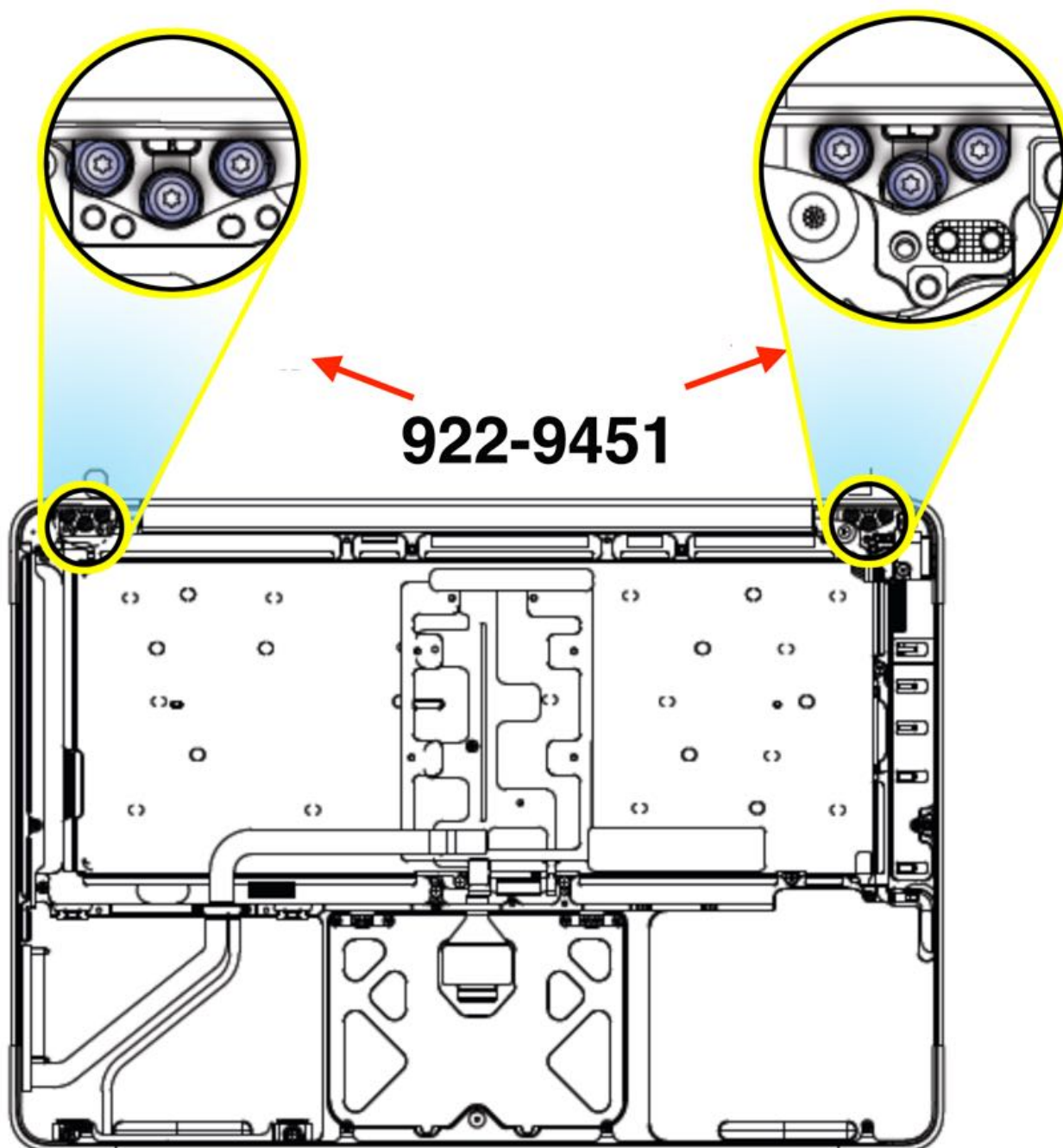
## Bottom Case

All screw sizes shown are approximate and represent the total length of the screw.



Optical Drive, AirPort/Bluetooth, HD Flex cable, HD Bracket, Speaker, Fan





## MacBook Pro (13-inch, Mid 2012): External Views

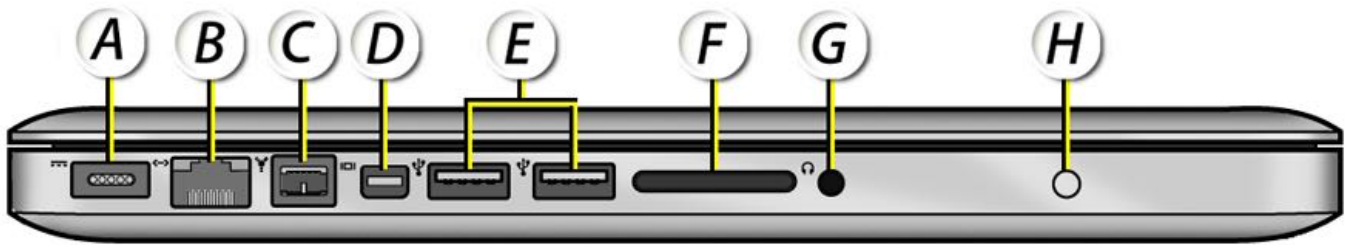
Front View



Slot View



Port View



A = MagSafe Power

B = Gigabit Ethernet (10/100/1000 Base-T)

C = FireWire 800

D = Thunderbolt\*

E = USB 3

F = SDXC card slot

G = Headphone Out/Optical Digital Audio Out

H = Battery Indicator Light (BIL) Button

\* This port connects Thunderbolt-compatible devices for high-speed data transfer or an external display that uses Thunderbolt or Mini DisplayPort.



### MacBook Pro (13-inch, Early and Late 2011, Mid 2012): Internal View

### Bottom Case Removed



## Service Guide Feedback

This escalation path is intended only for content issues with Service Guide articles that begin with the prefix IT, RP, SD, SM, SV or TP.

Please provide a clear and concise description of the content issue you encountered and steps to reproduce. Other information that helps us help you:

- Article Number(s)
- Serial Number(s)
- screenshots

Email the **AppleCare Field Service Documentation** team at **smfeedback6@apple.com**.

**Note:** You may not receive a response, but all comments will be reviewed and investigated as needed.